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MISSISSIPPI

Agricultural and Mechanical College

Mississippi Agricultural

EXPERIMENT STATION.

357
138

BULLETIN NO. 51.

100

ANALYSES OF

COMMERCIAL FERTILIZERS

ON SALE IN THE STATE.

132836

AGRICULTURAL COLLEGE, MISS.,

January 15th, 1899.

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Mississippi Fertilizer Control.

INSPECTION AND ANALYSES OF FERTILIZERS

BY THE CHEMICAL DEPARTMENT OF THE

MISSISSIPPI AGRICULTURAL AND MECHANICAL COLLEGE.

B. W. KILGORE, State Chemist.
W. F. HAND, Assistant Chemist.
E. W. MAGRUDER, Ass't. Chemist.
J. S. CARROLL, Ass't. Chemist.

The analyses presented in this bulletin are of samples of fertilizers collected by the fertilizer inspector of this department. The samples were taken about the middle of December from goods in the hands of fertilizer dealers, and therefore represent the composition of the goods the farmers *are buying or will buy.*

This is the first edition of the fertilizer bulletins for this season—1898–99. From now on till the end of the growing season the fertilizer inspector will make frequent trips over the portion of the State where fertilizers are used and collect samples from goods in the dealers' hands. These samples will be analyzed as promptly as possible

NOTE.—The analysis and inspection of commercial fertilizers is by law done by the Professor of Chemistry at the College, who is State Chemist. The results being considered of agricultural value are sent out by the Experiment Station. All communications in regard to these Bulletins or analyses should be addressed to State Chem

and the results published for the benefit of those interested in them. It is proposed to send out the second bulletin on February 15th; the third, March 15th; the fourth, April 15th, and the fifth, to include all the work of the season, some time during the summer. *These bulletins will be sent free to any person requesting them.*

TERMS USED IN ANALYSES.

Nitrogen, Phosphoric Acid, and Potash are the three constituents in a fertilizer which give to it its value. They do not make up all of a fertilizer—in fact, in most fertilizers other constituents are present in larger quantities than are these—but they are the only ones to which values need be assigned. The amounts of these constituents found in the fertilizers analyzed are expressed in the table as percentages or pounds in one hundred pounds of the fertilizer.

Four columns are given to Phosphoric Acid. In the first is found the water-soluble phosphoric acid, or the portion dissolved by cold water; in the second one is found the citrate-soluble, or the portion soluble in ammonium citrate solution; in the third, the portion not soluble in either water or citrate solution, but soluble in strong acid; in the fourth column is given the total phosphoric acid, or the sum of the preceding forms. The water-soluble and citrate-soluble represent the phosphoric acid immediately available for plant growth.

Two sets of percentages are given in the table, "found" and "guaranteed." The percentages found represent the results actually obtained in the analysis of the fertilizers, while the guaranteed percentages are what the manufacturers claim them to contain.

VALUATIONS.

In order to have a basis of comparison for the different fertilizers, values are assigned to the three valuable ingredients—nitrogen, phosphoric acid, and potash. These valuations are not intended to represent *crop producing power or agricultural value*, but are *estimates of the commercial value* of nitrogen, phosphoric acid, and potash in the materials supplying them. While the valuations are only approximate, it is believed that they fairly represent the cost of making and putting the fertilizers on the market. They are based upon a careful examination of the trade conditions, wholesale and retail, and upon quotations from manufacturers.

The figures used in calculating the "relative value per ton" in this bulletin are the same as those used last season, and are as follows:

	per pound.
For Nitrogen	12.5 cents
For potash	5 cents
For water-soluble phosphoric acid in mixed fertilizers	5 cents
For water-soluble phosphoric acid in unmixed acid phosphates	4.5 cents
For citrate-soluble phosphoric acid in mixed fertilizers	4.5 cents
For citrate-soluble phosphoric acid in unmixed acid phosphates	4 cents
For phosphoric acid in fine ground bone	3 cents
For phosphoric acid in medium and coarse bone	2.5 cents

All relative values during this season will be calculated by the use of these figures.

HOW RELATIVE VALUES ARE CALCULATED.

It may not be clear to all how values per ton are calculated. To make this plain an example is given. It is to be remembered that the figures in the table represent pounds and parts of a pound of nitrogen, phosphoric acid, and potash in one hundred pounds of the fertilizer, and that there are twenty hundred pounds in one ton (2,000 pounds.)

The calculation is made as follows:

Percentage or lbs. in 100.	Val. per 100 lbs.	Val. per ton (2,000 lbs.)
6 lbs. Water-sol. phos. acid at 5c per lb.	$0.30 x 20 =	$ 6 00
2 lbs. Citrate-sol. phos. acid at 4½c. per lb	0.09 x 20 =	1 80
2 lbs. Nitrogen at 12½ cents per pound...	0.25 x 20 =	5 00
2 lbs. Potash at 5 cents per pound.....	0.10 x 20 =	2 00
Total value.....	$0.74 x 20 =	$ 14.80

DATA IN THE TABLE.

The data in the table will be readily understood. In it will be found the analyses of samples collected this season. These goods are now on sale, and the analyses should receive careful study, as they show the character of the fertilizers being offered to the farmers. Several analyses are given of some of the brands, together with the dealers selling them, and under the analyses will be found the guarantees made by the manufacturers. A comparison of these will show how well the goods agree with the claims made for them.

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	Capital Fertilizer Company, Jackson, Miss.	
970	ACID PHOSPHATE	I. M. Eagan, Crystal Springs.. Guarantee .....
971	NONPAREIL.....	E. L. Scott, Summit.....
972	"	M. J. L. Hoye's Sons, Newton.
973	"	Becker, Lyell & McGrath Co. Ws'n Guarantee.....
974	RED STAR.....	Wm. Atkinson & McDonald, Ws'n. Guarantee .....
975	OUR VEGETABLE GROW'R	Hutchison & Co., Crystal Sprn'g's Guarantee .....
	Jackson Fertilizer Company, Jackson, Miss.	
976	HIGH GRADE ACID PHOSPHATE.....	W. H. Chambliss, Newton..... Guarantee.....
977	ROYAL C.....	Earns, Long & Co., Wesson....
978	"	W. H. Chambliss, Newton..... Guarantee .....
979	VEGETABLE AND FRUIT. FERTILIZER.....	Lotterhos & Huber, Crystal Sp. Guarantee .....
	Sold by **Marbach & Eagan,** Crystal Springs, Miss.	
980	BAT GUANO.....	I. M. Eagan, Crystal Springs.. Guarantee .....
	Meridian Fertilizer Factory, Meridian, Miss.	
981	GERMAN KAINIT.....	W. H. Barron & Co.. Crystal Sps. Guarantee .....
982	MERIDIAN HOME MIX'UR	J. McGrath & Sons, Brookhaven.

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water-Soluble	Citrate-Soluble.	Insoluble.	Total.			
970	12.15	10.77	2.59	.44	13.80	.....	.....	$11.77
....	.....	*10.00*	*2.00*	*.50*	*12.50*	.....	.....	*10.60*
971	12.77	6.73	2.92	.43	10.08	1.50	2.15	15.26
972	10.73	8.06	2.36	.46	10.88	1.58	2.09	16.22
973	12.53	6.92	2.49	.49	9.90	1.58	2.23	15.34
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.50*	*2.00*	*14.55*
974	14.10	6.94	2.51	.68	10.13	1.63	1.98	15.25
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.50*	*2.00*	*14.55*
975	9.05	5.10	2.45	.37	7.92	2.49	6.22	19.75
....	.....	*6.00*	*2.00*	*1.00*	*9.00*	*2.25*	*3.50*	*16.93*
976	12.03	11.53	1.92	.97	14.42	.....	.....	11.91
....	.....	*10.00*	*2.00*	*2.00*	*14.00*	.....	.....	*10.60*
977	22.35	7.27	2.57	.32	10.16	1.78	1.95	15.98
978	20.14	7.40	2.22	.97	10.59	1.70	1.90	15.55
....	.....	*6.00*	*1.60*	*1.00*	*8.60*	*1.55*	*1.80*	*13.12*
979	16.46	5.07	2.06	.36	7.49	3.26	4.47	19.54
....	.....	*3.00*	*3.00*	*1.00*	*7.00*	*3.00*	*4.00*	*17.20*
980	18.35	.....	.....	.....	6.59	4,96	1.19	17.53
....	.....	.....	.....	.....	*5.00*	*4.25*	*.65*	*14.28*
981	3.71	.....	.....	.....	.....	.....	13.02	13.02
....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
982	12.17	8.45	3.01	.81	12.27	1·75	2.11	17.64

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
984	MERIDIAN HOME MIX'UR	J. P. Myer, Ellisville..... Guarantee .....
985	MERIDIAN SOL'E GUANO	Wm. Atkinson&McDonald, Ws'n Guarantee .....
986	MERIDIAN ACID PHOS'TE	W. B. Richardson, Newton.... Guarantee .....
	Mobile Phosphate & Chemical Co., Mobile, Ala.	
987	I.X.L. ACID PHOSPHATE	Winner & Meyer, Meridian.... Guarantee .....
988	KAINIT.....	Winner & Meyer, Meridian... Guarantee .....
989	MOBILE STANDARD.....	Winner & Meyer, Meridian... Guarantee .....
	New Orleans Acid and Fertilizer Co., New Orleans, La.	
990	BLOOD, BONE, & POTASH	Louis Cohn&Bros., Brookhaven Guarantee.....
991	GOLDSMITH'S IMP. MIXT.	Louis Cohn&Bros., Brookhaven
992	" "	Earns, Long & Co., Wesson. Guarantee.....
	Standard Guano & Chemical Co., New Orleans, La.	
993	BOOD, BONE, AND MEAT	S. J. Johnson, Ellisville..... Guarantee.....
994	MISS. HOME GUANO....	HattiesburgComp. Co., Hatties Guarantee.....
995	STERN'S AMMONIATED R. B. SUPERPHOSPHATE..	B. F. Fridge, Ellisville.....
996	" " "	Hyman Mercantile Co., Summ Guarantee.....

Laboratory Number	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value per Ton.
		Water-Soluble.	Citrate-Soluble.	Insoluble.	Total.			
984	13.12	8.02	2.12	.75	10.89	1.76	2.18	$ 16.51
....	.....	*7.75*	*2.00*	*1.00*	*10.75*	*1.75*	*1.85*	*15.78*
985	13.84	6.64	3.21	.86	10.71	1.74	2.19	16.07
....	.....	*7.75*	*2.00*	*1.00*	*10.75*	*1.75*	*1.85*	*15.78*
986	15.99	13.37	1.94	.49	15.80	.....	.....	13.59
....	.....	*12.00*	*2.50*	*1.00*	*15.50*	.....	.....	*12.80*
987	13.29	13.05	3.04	.58	16.67	.....	.....	14.18
....	.....	*10.00*	*2.00*	*1.50*	*13.50*	.....	.....	*10.60*
988	4.86	.....	.. ..	.....	.....	.....	11.92	11.92
....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
989	11.92	6.82	2.88	2.84	12.54	1.74	2.09	15.85
....	.....	*6.00*	*2.00*	*1.50*	*9.50*	*1.65*	*2.00*	*13.93*
990	12.49	6.82	2.35	4.77	13.94	1.77	2.11	15.47
....	.....	*7.50*	*2.50*	*2.00*	*12.00*	*1.75*	*1.00*	*15.13*
991	13.36	7.89	2.31	.88	11.08	2.19	1.42	16.86
992	12.41	8.12	2.47	1.47	12.06	2.08	1.85	17.39
....	.....	*7.50*	*2.50*	*2.00*	*12.00*	*1.75*	*1.00*	*15.13*
993	12.06	8.10	2.53	1.59	12.22	2.20	2.64	18.52
....	.....	*4.00*	*4.25*	.....	.....	*1.70*	*2.00*	*14.08*
994	12.17	8.15	2.74	1.56	12.45	2.14	2.72	18.69
....	.....	*4.00*	*5.00*	.....	.....	*1.65*	*2.00*	*14.63*
995	11.74	6.41	3.30	1.00	10.71	1.70	1.74	15.37
996	11.55	7.02	2.63	1.23	10.88	1.73	1.82	15.53
....	.....	*4.00*	*4.00*	*1.00*	*9.00*	*1.65*	*1.50*	*13.23*

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Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
997	ACID PHOSPHATE.....	S. J. Johnson, Ellisville.....
		Guarantee.....
	Threefoot Bros. & Co., Meridian, Miss.	
998	THREEFOOT'S HIGH GR'D ACID PHOSPHATE.....	Threefoot Bros. & Co., Meridian
		Guarantee.....
999	THREEFOOT'S IMPROVED MIXTURE.....	Threefoot Bros. &Co., Meridian.
		Guarantee.....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Val. Per Ton.
		Water-Soluble.	Citrate-Soluble.	Insoluble.	Total.			
997	13.09	10.57	5.88	.46	16.91	.....	.....	14.22
....	.....	*10.00*	*2.00*	*1.00*	*13.00*	.....	.....	*10.60*
998	16.46	13.05	3.18	.91	17.14	.....	.....	14.29
....	.....	*12.50*	*2.50*	*1.00*	*16.00*	.....	.....	*13.25*
999	12.91	8.35	2.60	.84	11.79	1.74	2.36	17.40
....	.....	*8.60*	*2.00*	*1.00*	*11.00*	*1 75*	*2.00*	*16.18*

Analyses of Fertilizers

——ON SALE——

IN MISSISSIPPI.

First Monthly Edition, Season 1898-'99.

These bulletins will be sent free to any address upon application to State Chemist.

EXPERIMENT STATION

—OF THE—

MISSISSIPPI

Agricultural and Mechanical College

BULLETIN NO. 52.

ANALYSES OF

COMMERCIAL FERTILIZERS

ON SALE IN THE STATE.

AGRICULTURAL COLLEGE, MISS.,

February 15th, 1899.

Mississippi Fertilizer Control.

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MISSISSIPPI AGRICULTURAL AND MECHANICAL COLLEGE.

B. W. KILGORE, State Chemist.
W. F. HAND, Assistant Chemist.
E. W. MAGRUDER, Ass't. Chemist.
J. S. CARROLL, Ass't. Chemist.

The analyses presented in this bulletin are of samples of fertilizers collected by the fertilizer inspector of this department and the guaranteed analyses of various brands registered for sale in the State. The samples were taken during January and February from goods in the hands of fertilizer dealers, and therefore represent the composition of the goods the farmers *are buying or will buy.*

This is the second edition of the fertilizer bulletin for this season—1898–99. From now on till the end of the growing season the fertilizer inspector will make frequent trips over the portion of the State where fertilizers are used and collect samples from goods in the dealers' hands. These samples will be analyzed as promptly as possible

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Two sets of percentages are given in table I, "found" and "guaranteed." The percentages found represent the results actually obtained in the analysis of the fertilizers, while the guaranteed percentages are what the manufacturers claim them to contain.

VALUATIONS.

In order to have a basis of comparison for the different fertilizers, values are assigned to the three valuable ingredients—nitrogen, phosphoric acid, and potash. These valuations are not intended to represent *crop producing power or agricultural value*, but are *estimates of the commercial value* of nitrogen, phosphoric acid, and potash in the materials supplying them. While the valuations are only approximate, it is believed that they fairly represent the cost of making and putting the fertilizers on the market. They are based upon a careful examination of the trade conditions, wholesale and retail, and upon quotations from manufacturers.

The figures used in calculating the "relative value per ton" in this bulletin are the same as those used last season, and are as follows:

	per pound.
For Nitrogen	12.5 cents
For potash	5 cents
For water-soluble phosphoric acid in mixed fertilizers	5 cents
For water-soluble phosphoric acid in unmixed acid phosphates	4.5 cents
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For citrate-soluble phosphoric acid in unmixed acid phosphates	4 cents
For phosphoric acid in fine ground bone	3 cents
For phosphoric acid in medium and coarse bone	2.5 cents

All relative values during this season will be calculated by the use of these figures.

HOW RELATIVE VALUES ARE CALCULATED.

It may not be clear to all how values per ton are calculated. To make this plain an example is given. It is to be remembered that the figures in the table represent pounds and parts of a pound of nitrogen, phosphoric acid, and potash in one hundred pounds of the fertilizer, and that there are twenty hundred pounds in one ton (2,000 pounds.)

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2 lbs. Nitrogen at 12½ cents per pound...	0.25 x 20 =	5 00
2 lbs. Potash at 5 cents per pound.....	0.10 x 20 =	2 00
Total value.....	$0.74 x 20 =	$ 14.80

DATA IN THE TABLES.

The data in the tables will be readily understood. In table I will be found the analyses of samples collected this season. These goods are now on sale, and the analyses should receive careful study, as they show the character of the fertilizers being offered to the farmers. Several analyses are given of some of the brands, together with the dealers selling them, and under the analyses will be found the guarantees made by the manufacturers. A comparison of these will show how well the goods agree with the claims made for them.

TABLE II.

In table II will be found a list of the brands of fertilizers registered and legally on sale in the State, together with the guaranteed composition of the brands, and the relative values per ton calculated from these guarantees. Analyses of a number of these brands have not yet been made as samples of the goods have not been obtained.

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	Armour Packing Company, Kansas City, Mo.	
1037	FERTILIZER NO. 271.....	W. L. Wellman, Wesson..... Guarantee .....
	Birmingham Fertilizrr Company, Birmingham, Ala.	
1038	PROLIFIC ACID PHOS'TE.	Threefoot, Bros.&Co., Meridian Guarantee .....
1024	BIRMINGHAM HIGH GRDE FERTILIZER.....	Gilmore & May, Amory..... Guarantee .....
	Capital Fertilizer Company, Jackson, Miss.	
970	HIGH GRADE ACID PHOSPHATE.....	I. M. Eagan, Crystal Springs.. Guarantee .....
1039	KAINIT.....	W. C. Wilkinson, Crystal Sprgs Guarantee .....
1026	MISS. STATE GRANGE...	Max Priebatsch, Brookhaven.. Guarantee .....
971	NONPAREIL.....	E. L. Scott, Summit.....
972	"	M. J. L. Hoye's Sons, Newton.
973	"	Becker, Lyell&McGrathCo. Ws'n Guarantee.....
974	RED STAR.....	Wm. Atkinson&McDonald, Ws'n.
1040	"	W. C. Ellis, Steen's Creek..... Guarantee .....
975	OUR VEGETABLE GROW'R	Hutchison&Co..Crystal Sprn'g's Guarantee .....
	Jackson Fertilizer Company, Jackson, Miss.	
976	HIGH GRADE ACID PHOSPHATE	W. H. Chambliss, Newton..... Guarantee .....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water-Soluble.	Citrate-Soluble.	Insoluble.	Total.			
1037	5.90	3.52	4.98	.61	9.11	1.88	1.19	$13.89
.....	.....	*5.00*	*2.00*	*1.50*	*8.50*	*1.50*	*1.00*	*11.55*
1038	11.56	10.54	1.94	2.92	15.40	.....	.....	11.04
....	.....	*11.00*	*2.00*	*1.50*	*14.50*	.....	.....	*11.50*
1024	11.82	6.93	1.54	3.22	11.69	1.80	2.41	15.22
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.64*	*2.00*	*14.90*
970	12.15	10.77	2.59	.44	13.80	.....	.....	$11.77
....	.....	*10.00*	*2.00*	*.50*	*12.50*	.....	.....	*10.60*
1039	5.71	.....	....	.....	.....	.....	12.74	12.74
....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1026	12.82	7.11	2.48	.51	10.10	1.60	1.76	15.10
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.50*	*2.00*	*14.55*
971	12.77	6.73	2.92	.43	10.08	1.50	2.15	15.26
972	10.73	8.06	2.36	.46	10.88	1.58	2.09	16.22
973	12.53	6.92	2.49	.49	9.90	1.58	2.23	15.34
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.50*	*2.00*	*14.55*
974	14.10	6.94	2.51	.68	10.13	1.63	1.98	15.25
1040	12.04	7.48	2.19	.36	10.03	1.83	2.23	16.26
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.50*	*2.00*	*14.55*
975	9.05	5.10	2.45	.37	7.92	2.49	6.22	19.75
....	.....	*6.00*	*2.00*	*1.00*	*9.00*	*2.25*	*3.50*	*16.93*
976	12.03	11.53	1.92	.97	14.42	.....	.....	11.91
....	.....	*10.00*	*2.00*	*2.00*	*14.00*	.....	.....	*10.60*

TABLE I.—Analyses of Commercial Fertilizers Col-

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
1027	GULF STATES GUANO..	Mayes & Berry, Hazlehurst....
		Guarantee .....
1036	ROYAL C.....	The Mills-Evans Co., McComb.
977	"	Earns, Long & Co., Wesson....
978	"	W. H. Chambliss, Newton.....
		Guarantee .....
	VEGETABLE AND FRUIT.	
979	FERTILIZER.....	Lotterhos & Huber, Crystal Sp.
		Guarantee .....
	Sold by	
	Marbach & Eagan,	
	Crystal Springs, Miss.	
980	BAT GUANO.....	I. M. Eagan, Crystal Springs..
1047	" "	P. H. Traweek, Gallman.....
		Guarantee .....
	Meridian Fertilizer Factory,	
	Meridian, Miss.	
1029	MERIDIAN BLOOD & BONE	A. E. Dalrymple, Amory.....
1042	" " "	Holmes Bros., McComb City...
		Guarantee .....
	MERIDIAN FARMER'S	
1030	FRIEND.....	S. Cohn & Sons, Magnolia.....
		Guarantee .....
981	KAINIT.....	W.H.Barron & Co.. Crystal Sps.
		Guarantee .....
1028	ENGLISH ACID PHOS'ATE	A. E. Dalrymple, Amory.....
1041	" " "	Bonner Bros., Sandersville....
		Guarantee .....
986	MERIDIAN ACID PHOS'TE	W. B. Richardson, Newton ....
1043	" " " ..	Phillips, Hinds&Co.. Booneville
		Guarantee .....
985	MERIDIAN SOL'E GUANO	Wm.Atkinson&McDonald, Ws'n
		Guarantee .....
982	MERIDIAN HOME MIX'UR	J.McGrath&Sons, Brookhaven.
983	" " " ..	Walton, Gillaspy&Russell,H'ky

Laboratory Number	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value per Ton.
		Water-Soluble.	Citrate-Soluble.	Insoluble.	Total.			
1027	22.42	7.18	1.88	1.88	10.94	1.65	1.80	$14.80
....	.....	*6.00*	*1.60*	*1.00*	*8.60*	*1.55*	*1.80*	*13.12*
1036	21.85	7.15	2.20	1.88	11.23	1.61	1.67	14.83
977	22.35	7.27	2.57	.32	10.16	1.78	1.95	15.98
978	20.14	7.40	2.22	.97	10.59	1.70	1.90	15.55
....	.....	*6.00*	*1.60*	*1.00*	*8.60*	*1.55*	*1.80*	*13.12*
979	16.46	5.07	2.06	.36	7.49	3.26	4.47	19.54
....	.....	*3.00*	*3.00*	*1.00*	*7.00*	*3.00*	*4.00*	*17.20*
980	18.35	.....	.....	.....	6.59	4.96	1.19	17.53
1047	25.28	.....	.....	.....	7.35	4.12	93	15.64
....	.....	.....	.....	.....	*5.00*	*4.25*	*.65*	*14.28*
1029	15.99	8.88	2.45	2.89	14.22	1.42	1.61	16 36
1042	17.26	8.31	2.92	1.32	12.54	1.48	1.78	16.42
....	.....	*7.75*	*2.00*	*2.50*	*12.25*	*1.65*	*1.85*	*15.53*
1030	15.48	9.21	2.06	1.05	12.32	1.41	2.11	16.70
....	.....	*8.00*	*2.50*	*1.00*	*11.50*	*1.25*	*1.50*	*14.88*
981	3.71	.....	.....	.....	.....	.....	13.02	13.02
....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1028	15.27	11.46	3.55	.54	15.55	.....	.....	13.16
1041	15.87	11.58	3.12	.78	15.48	.....	.....	12.92
....	.....	*10.00*	*2.50*	*.50*	*13.00*	.....	.....	*11.00*
986	15.99	13.37	1 94	.49	15.80	.....	.....	13.59
1043	16.08	11.58	2.75	.81	15.14	.....	.....	12.62
....	.....	*12.00*	*2.50*	*1.00*	*15.50*	.....	.....	*12.80*
985	13.84	6.64	3.21	.86	10.71	1.74	2.19	16.07
....	.....	*7.75*	*2.00*	*1.00*	*10.75*	*1.75*	*1.85*	*15.78*
982	12.17	8.45	3.01	.81	12.27	1·75	2.11	17.64
983	13.22	8.25	2.35	1.04	11.64	2.81	2.28	19.67

TABLE I.—Analyses of Commercial Fertilizers Col-

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
984	MERIDIAN HOME MIX'RE	J. P. Myer, Ellisville.....
1044	" " " ..	J. L. Miller, Gallman.....
		Guarantee .....
	MERIDIAN VEGETABLE	
1045	GROWER	Hattiesburg Compress Co., Hbg
		Guarantee.....
	Mobile Phosphate & Chemical Co., Mobile, Ala.	
1010	I.X.L. ACID PHOSPHATE	W. J. Hubbuard, Shuqualak...
987	" " " ..	Winner & Meyer, Meridian....
		Guarantee .....
988	KAINIT.....	Winner & Meyer, Meridian....
		Guarantee.....
1006	MOBILE STANDARD.....	W. J. Hubbard, Shuqualak....
989	" "	Winner & Meyer, Meridian....
		Guarantee .....
	New Orleans Acid and Fertilizer Co., New Orleans, La.	
1048	BLK. DIAMOND ACID PH.	Robinson Mer. Co., Centreville.
1032	" " " "	G. W. Walton, Hickory.....
		Guarantee .....
990	BLOOD, BONE, & POTASH	Louis Cohn&Bros., Brookhaven
		Guarantee.....
991	GOLDSMITH'S IMP. MIXT.	Louis Cohn&Bros., Brookhaven
992	" "	Earns, Long & Co., Wesson...
1049	" "	Peets & Norman Co., Haziehurst
		Guarantee.....
1050	KAINIT.....	Robinson Mer. Co., Centerville.
		Guarantee .....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Val. Per Ton.
		Water-Soluble.	Citrate-Soluble.	Insoluble.	Total.			
984	13.12	8.02	2.12	.75	10.89	1.76	2.18	$16.51
1044	11.50	8.37	2.54	.47	11.38	1.68	1.91	16.77
....	.....	*7.75*	*2.00*	*1.00*	*10.75*	*1.75*	*1.85*	*15.78*
1045	10.75	5.99	2.34	.65	8.98	2.69	6.25	21.07
....	.....	*5.00*	*1.00*	*.50*	*6.50*	*2.50*	*6.00*	*18.15*
1010	16.24	13.96	1.98	.24	16.18	.....	.....	14.19
987	13.29	13.05	3.04	.58	16.67	.....	.....	14.18
....	.....	*10.00*	*2.00*	*1.50*	*13.50*	.....	.....	*10.60*
988	4.86	.....	.....	.....	.....	.....	11.92	11.92
....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1006	13.61	7.37	1.65	4.01	13.03	1.98	2 15	15.95
989	11.92	6.82	2.88	2.84	12.54	1.74	2.09	15.85
....	.....	*6.00*	*2.00*	*1.50*	*9.50*	*1.65*	*2.00*	*13.93*
1048	16.08	12.98	1.62	1.65	16.25	.....	.....	12.98
1032	15.91	12.79	1.50	1.92	16.21	.....	.....	12.71
....	.....	*11.00*	*2.00*	*2.00*	*15.00*	.....	.....	*11.50*
990	12.49	6.82	2.35	4.77	13.94	1.77	2.11	15.47
....	.....	*7.50*	*2.50*	*2.00*	*12.00*	*1.75*	*1.00*	*15.13*
991	13.36	7.89	2.31	.88	11.08	2.19	1.42	16.86
992	12.41	8.12	2.47	1.47	12.06	2.08	1.85	17.39
1049	12.83	7.87	2.65	1.14	11.66	2.15	1.94	17.57
....	.....	*7.50*	*2.50*	*2.00*	*12.00*	*1.75*	*1.00*	*15.13*
1050	5.15	.....	.....	.....	.....	.....	12.54	12.54
....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	Standard Guano & Chemical Co., New Orleans, La.	
997	Acid Phosphate.....	S. J. Johnson, Ellisville.....
1053	" "	S. J. Taylor, Enterprise.....
		Guarantee.....
	Bood, Bone, and Meat	
993	Guano.....	S. J. Johnson, Ellisville.....
		Guarantee.....
	Chanpion Farmer's	
1033	Choice.....	S. Wolf, Osyka.....
		Guarantee.....
1035	Kainit.....	Wm. Atkinson-Bacot Co., Osyka
		Guarantee.....
1034	Ground Bone.....	Wm. Atkinson-Bacot Co., Osyka
		Guarantee.....
994	Miss. Home Guano....	HattiesburgComp. Co., Hattiesb
		Guarantee.....
	Stern's Ammoniated R.	
1052	B. Superphosphate..	W. J. Davis, Terry.....
995	" " "	B. F. Fridge, Ellisville.....
996	" " "	Hyman Mercantile Co., Summit.
		Guarantee.....
	Threefoot Bros. & Co., Meridian, Miss.	
	Threefoot's High Gr'd	
998	Acid Phosphate.....	Threefoot Bros. & Co., Meridian
		Guarantee.....
	Threefoot's Improved	
999	Mixture.....	Threefoot Bros. & Co., Meridian
		Guarantoe.....

Laboratory No.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Val. Per Ton.
		Water Soluble.	Citrate Soluble.	Insoluble.	Total.			
997	13.09	10.57	5.88	.46	16.91	.....	.....	14.22
1053	12.09	10.91	4.58	.96	16.45	.....	.....	13.48
....	.....	*10.00*	*2.00*	*1.00*	*13.00*	.....	.....	*10.60*
993	12.06	8.10	2.53	1.59	12.22	2.20	2.64	18.52
....	.....	*4.00*	*4.25*	.....	.....	*1.70*	*2.00*	*14.08*
1033	11.63	6.37	3.14	.74	10.25	2.29	1.46	16.39
....	.....	*4.00*	*4.00*	*1.00*	*9.00*	*1.65*	*1.50*	*13.20*
1035	4.38	.....	.....	.....	.....	.....	12.42	12.42
....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1034	5.36	.....	.....	.....	17.09	2.86	.....	15.70
....	.....	.....	.....	.....	*18.50*	*2.50*	.....	*15.50*
994	12.17	8.15	2.74	1.56	12.45	2.14	2.72	18.69
....	.....	*4.00*	*5.00*	.....	.....	*1.65*	*2.00*	*14.63*
1052	15.37	6.33	1.56	1.24	9.13	1.68	1.57	13.50
995	11.74	6.41	3.30	1.00	10.71	1.70	1.74	15.47
996	11,55	7.02	2.63	1.23	10.88	1.73	1.82	15.53
....	.....	*4.00*	*4.00*	*1.00*	*9.00*	*1.65*	*1.50*	*13.23*
998	16.46	13.05	3.18	.91	17.14	.....	.....	14.29
....	.....	*12.50*	*2.50*	*1.00*	*16.00*	.....	.....	*13.25*
999	12.91	8.35	2.60	.84	11.79	1.74	2.36	17,40
....	.....	*8.00*	*2.00*	*1.00*	*10.00*	*1.75*	*2.00*	*16.18*

TABLE II.—Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1898-'99.

Name of Brand and Address of Manufacturer.	Phosphoric Acid—Per Cent.				Nitrogen—per Cent.	Potash—per Cent.	Relative Value per Ton.
	Water Soluble.	Citrate Soluble.	Insoluble.	Total.			
Armour Packing Co.,							
Kansas City, Mo.							
Fertilizer No. 271	5.00	2.00	1.50	8.50	1.50	1.00	$11.55
Fertilizer No. 386	5.00	3.00	3.00	11.00	2.50	6.00	19.95
Blood Bone and Potash	5.00	4.00	2.00	11.00	4.00	7.00	25.60
Fine Ground Beef Bone	.....	.....	.....	.....	.....	.....	.....
Birmingham Fertilizer Co.,							
Birmingham, Ala.							
Birmingham High Grade Fertilizer	7.00	2.00	1.50	10.50	1.64	2.00	14.90
Boss Guano	7.00	2.00	1.50	10.50	1.64	2.00	14.90
Cahaba Acid Phosphate	10.00	2.00	1.50	13.50	.....	.....	10.60
Prolific Acid Phosphate	11.00	2.00	1.50	14.50	.....	.....	11.50
Capital Fertilier Co.,							
Jackson, Miss.							
High Grade Acid Phosphate	10.00	2.00	.50	12.50	.....	.....	10.60
Kainit	.....	.....	.....	.....	.....	12.00	12.00
Mississippi Guano	7.00	2.00	1.50	10.50	1.50	2.00	14.55

Nonpareil	7.00	2.00	1.50	10.50	1.50	2.00	14.55
Our Vegetable Grower	6.00	2.00	1.00	9.00	2.25	3.50	16.93
Producer	7.00	2.00	1.50	10.50	1.50	2.00	14.55
Red Star Brand Guano	7.00	2.00	1.50	10.50	1.50	2.00	14.55
Continental Fertilizer Co.,							
Nashville, Tenn,							
Sunny South Acid Phosphate	10.00	3.00	1.00	14.00	.....	.....	11.40
Eddystone Soluble Guano	7.00	2.00	1.00	10.00	1.65	1.00	13.93
The Goulding Fertilizer Co., Ltd.							
Pensacola, Fla.							
Goulding's High Grade Acid Phosphate	12.00	3.00	1.00	16.00	.....	.....	13.20
Goulding's High Grade Acid Phos. and Potash	11.00	3.00	1.00	15.00	.....	1.00	14.70
Goulding's Bone Compound	8.00	2.00	2.00	12.00	1.65	1.50	15.43
Jackson Fertilier Co.,							
Jackson, Miss.							
Acid Phosphate	10.00	2.00	2.00	14.00	.....	.....	10.60
Gulf States Guano	6.00	1.60	1.00	8.60	1.55	1.80	13.12
Kainit	.....	.....	.....	.....	.....	12.00	12.00
Royal C. Brand	6.00	1.60	1.00	8.60	1.55	1.80	13.22
Vegetable and Fruit	3.00	3.00	1.00	7.00	3.00	4.00	17.29
Merbach & Eagan,							
Crystal Springs, Miss.							
Bat Guano	.....	.....	.....	5.00	4.25	.65	14.28
A. D. Adair & McCarty Bros.,							
Atlanta, Ga.							
Buffalo Bone Fertilizer	6.00	3.00	2.00	11.00	1.75	2.00	15.08
Farish Furman Formula	6.00	4.00	2.00	12.00	.....	2.00	11.60
Furman's High Grade Dissolved Bone	8.00	4.00	2.00	14.00	.....	.....	10.49
Furman's Sol. Bone with Ammonia and Potash	6.00	4.00	2.00	12.00	.85	1.00	12.73

TABLE II.—Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1898-'99.

Name of Brand and Address of Manufacturer.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton
	Water Soluble.	Citrate Soluble	Insoluble.	Total.			
Meridian Fertilizer Factory, Melidian, Miss.							
Meridian Acid Phosphate	12.00	2.50	1.00	15.50	.....	.....	12.80
English Acid Phosphate	10,00	2.50	.50	13.00	.....	.....	11.00
Meridian Blood and Bone	7.75	2.00	2.50	12.25	1.65	1.85	15.53
Meridian Farmers' Friend	8.00	2.50	1.00	11.50	1.25	1.50	14.88
Meridian Home Mixture	7.75	2.00	1.00	10.75	1.75	1.85	15.78
Meridian Vegetable Grower	5.00	1.00	.50	6.50	2.50	6.00	18.15
Meridian Soluble Guano	7.75	2.00	1.00	10.75	1.75	1.85	15.78
Kainit	.....	.....	.....	.....	.....	12.00	12.00
Mobile Phosphate & Chemical Manufacturing Co., Mobile, Ala.							
English Acid Phosphate	12.00	2.00	1.00	15.00	.....	.....	12.40
I. X. L. Acid Phosphate	10.00	2.00	1,50	13.50	.....	.....	10.60
Eclipse Soluble Guano	6.00	2.00	1.50	9.50	1.65	2.00	13.93
German Kainit	.....	.....	.....	.....	.....	12.00	12.00
K. K. K. Sol. Ammoniated Bone	8,75	1.25	1.50	11.50	.85	1.00	13.00
Mobile Standard Guano	6.00	2.00	1.50	9.50	1.65	2.00	13.93

New Orleans Acid & Fertilizer Co. New Orleans, La.							
Black Diamond Acid Phosphate	11.00	2.00	2.00	15.00	.....	.....	$11.50
Crescent City Acid Phosphate	11.00	2.00	2.00	15.00	.....	.....	11.50
Gold Dust	7.50	2.50	2.00	12.00	1.75	1.00	15.13
Goldsmith's Improved Mixture	7.50	2.50	2.00	12.00	1.75	1.00	15.13
Dissolved Bone	13.00	2.00	2.00	17.00	.....	.....	13.30
Vegetable Grower	6.00	1.25	2.00	9.25	2.80	2.60	16.73
Planters' Fertilizer Mfg., Co., New Orleans, La.							
Cotton and Corn	7.00	.....	.....	.....	2.25	2.00	14.63
Southern Fertilizer Co. Atlanta, Ga.							
Scotts' High Grade Acid Phosphate	11.00	3.00	1.00	15.00	.....	.....	12.30
Scotts' Gossypium Phospho	6.00	3.50	1.00	10.50	2.05	2.00	16.28
Scotts' Potasso Phospho	10.00	3.00	1.00	14.00	.....	2.00	14.70
Standard Guano and Chemical Mfg. Co. New Orleans, La.							
Acid Phosphate	10.00	2.00	1.00	13.00	.....	.....	10.60
Blood Bone and Meat Guano	4.00	4.25	.....	.....	1.70	2.00	14.08
Champion Farmers' Choice	4.00	4.00	1.00	9.00	1.65	1.50	13.23
Ground Bone	.....	.....	.....	18.50	2.50	.....	15.50
I. C. Diamond Brand	4.00	4.00	1.00	9.00	1.65	1.50	13.23
Kainit	.....	.....	.....	.....	.....	12.00	12.00
Miss. Home Guano	4.00	5.00	.....	.....	1.65	2.00	14.62
Pelican Raw Bone Guano	4.00	4.00	1.00	9.00	1.65	1.50	13.23
Standard Ammoniated Sol. Guano	4.00	4.00	1.00	9.00	1.65	1.50	13.23
Threefoot's High grade English Acid Phosphate	15.00	2.00	.....	.....	.....	.....	13.30
Stern's Am. R. P. Super Phosphate	4.00	4.00	1.00	9.00	1.65	1.50	13.23

TABLE II.—Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1898-'99.

Name of Brand and Address of Manufacturer.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton
	Water Soluble.	Citrate Soluble.	Insoluble.	Total.			
Tennessee Chemical Co., Nashville, Tenn.							
Ox Bone and Potash	7.00	5.00	1.00	13.00	.....	1.00	12.50
Ox Bone with Ammonia and Potash	6.00	4.00	1.00	11.00	2.85	1.00	12.73
Ox Cotton Guano	6.00	4.00	1.00	11.00	1.65	1.00	14.73
Ox High Grade Dissolved Bone	8.00	6.00	1.00	15.00	.....	.....	12.00
Threefoot Bros. & Co., Meridian, Miss.							
Threefoot's High Grade Acid Phosphate	12.50	2.50	1.00	16.00	.....	.....	13.25
Threefoot's Improved Mixture	8.00	2.00	1.00	11.00	1.75	2.00	16.18

MISSISSIPPI AGRICULTURAL

EXPERIMENT STATION.

BULLETIN No. 53. MARCH, 1899.

SOME INSECTS INJURIOUS TO STOCK AND REMEDIES THEREFOR.

GLENN W. HERRICK.

HORN-FLY.

(*Haematobia serrata*, Rob.—Desv.)

With this insect we have an example of the importance of carefully guarding against the introduction of pests and noxious diseases from foreign countries. Prior to 1885, the Horn-fly was unknown in this country. Probably during the year 1886, or 1887, it was introduced into America from Europe, and was first reported in this state in 1891.

The damages caused by the insect have been much misunderstood and exaggerated. It injures stock principally by constantly irritating and worrying them, which causes a loss in vitality, a falling off in weight and lessening of growth in young stock, and in the case of milch cows a decrease in the flow of milk. Because the flies are seen in great numbers on the horns of cattle, it has been thought that the horns were injured by the maggots boring through and entering the head of the animal. This is not true. In fact, quite the reverse is true, because so long as the insects rest on the horns, the animal

is free from the worry and torment caused by the bite of the fly.

Preventives.—Repellants applied externally to stock is the best method of combatting the Horn-fly. Rather extensive experiments have been carried on at this Station, by Mr. H. E. Weed, to ascertain the best substance for repelling this insect.

Of the many substances used, a mixture of two parts of crude cotton-seed oil to one part of pine tar was considered the most effective. It should be applied to the animal with a large paint brush at milking time. If the cotton-seed oil is not procurable, fish oil may be used in its stead. One application is said to last from 4 to 6 days. It takes but a very short time to make the application, and the material costs but a trifle.

Another preparation, called Gnat Oil, and applied in the same manner as the tar and oil, gives quite as good results. It is made as follows:

Crude carbolic acid, 1 ounce.
Pennyroyal, $\frac{3}{4}$ ounce.
Sulphur, $\frac{1}{4}$ pound.
Crude cotton-seed oil, 1 gallon.

A thorough coating, completely covering the body of the animal, should be applied once in 4 to 6 days.

THE SOUTHERN BUFFALO GNAT.

(*Simulium pecuarum.* Riley.)

The Southern Buffalo Gnat is one of the most serious pests known to owners of stock in the Southern Mississippi Valley. It usually appears soon after the first continuous warm spell in early spring, varying in its time of appearance according as the spring is early or late. All the counties of this state bordering on the Mississippi, and even some inland counties, are subject to invasion by this insect.

*Preventives.—Various remedies have been tried for the prevention and destruction of this insect, most of which, however, have proved impracticable. The most satisfactory way of dealing with it, is to use some repellant or preventive. Smudges have thus far proved the best method of protecting animals against the Buffalo gnat. Many planters, during the year, collect all sorts of materials which will produce a dense and stifling smoke, such as leather, clothing, dried dung, etc. As soon as the gnats appear they begin burning these materials and keep the fires going until the insects disappear. Smudges are located in the fields to protect the working teams, and in cities, fires are kept before the doors of livery barns.

A coat of mud or syrup has been found to protect animals to some extent. It has also been observed that short-haired animals, and those which have shed their winter coat of hair and have become smooth, are not so much troubled as those covered with long hair. Hence it is of advantage to clip horses in early spring. Keeping stock in darkened stables during an invasion of gnats, is also of great aid in protecting the animals, because the insects will not enter a dark room to a great extent. If the spring cultivation can be postponed until the gnats disappear, the danger will be averted by keeping the horses and mules in dark stables.

For the planters who cannot wait until the swarms have gone, various decoctions have been devised for coating the animals externally in hopes to repel the insects. Many of these have been found useful, but they necessitate frequent application in order to be effective. It is impracticable to use these remedies on stock at large. Such stock should either be confined in a darkened stable or driven to high open ground.

It has been found that grease of various kinds is the best preventive. Cotton-seed oil alone, or mixed with tar, kerosene, crude coal oil, or axle grease, are among the

*The above methods of prevention have been condensed from the U. S. Agricultural Report for 1886.

best. These should be applied twice a day. All of these remedies are more or less injurious to the animal, but their effect is small as compared with the gnat and soon passes away when the use of them is discontinued

A mixture of oil and tar has been found very effective against a closely related fly, and on account of its simplicity and inexpensiveness is strongly recommended. A quantity of coal tar is placed in the bottom of a large shallow receptacle, and a small quantity of oil of tar, or oil of turpentine, is stirred in. The receptacle is then filled with water and allowed to stand for several days until well impregnated with the odor. The animals to be protected are then washed with this water as often as seems to be necessary.

Animals that are allowed to run at large during the winter and have no shelter from the weather, are sure to suffer severely from the gnats. Cut, bruised, and ill-fed mules are the first to die. Intelligent planters say that if mules are well fed and cared for and greased twice a day while working in the field, they scarcely ever die when attacked.

Remedies for the Bites.—The remedy most highly recommended for the injuries caused by the bites, is to rub the animal thoroughly with water of ammonia and give internally a mixture of 40 to 50 grains of carbonate of ammonia to one pint of whiskey, repeating the dose every three or four hours until relieved.

Stock is said to have been cured by repeated doses of whiskey alone, at the same time confining the animal in a cool, dark place.

The immersion of animals in streams will often allay the fever and save them from death.

HORSE BOT-FLY.

(*Gastrophilus equi*, Fab.)

There is much diversity of opinion among both veterinarians and stock raisers as to the injuries caused by the Bot-fly. Probably all horses are infested with these para-

sites to a greater or less extent, and it would seem that the injuries inflicted depend upon the number of bots present in the horse. It is probable that the presence of a few bots causes no serious trouble, while in those cases where the whole inside of the horse's stomach is coated with the parasites the effect may be serious.

Methods of Prevention.—There are two ways to fight the Bot-fly. First by destroying the eggs and thus preventing the larvæ from entering the horse's stomach and intestines. Second, by using some remedy to expel the bots from the alimentary canal of the horse.

The first method is the safer, and we believe the most practicable. The eggs are glued to the hairs and are often found in abundance on the forelegs of horses. From some investigations carried on by Prof. Osborn, it would seem that the eggs hatch with some difficulty in ten days, while the greater part are probably hatched about fourteen days after being deposited. Moreover, they hatch only when the horse licks them with his tongue. It is then that they are conveyed to the mouth. From these facts it will be seen that if the eggs are removed once in ten days or two weeks not enough larvæ will enter the horse's mouth to do any harm.

The most satisfactory way to remove the eggs is to scrape them off, at least once in two weeks, with an old razor or a very sharp knife. This can be easily and thoroughly done in much less time than would at first be supposed. Although no great harm is done if all the eggs are not removed, yet it is best to take sufficient time to do it thoroughly.

The legs and body of the horse, wherever eggs occur, may be washed with a mixture of 1 part of carbolic acid to 30 parts of water. This should also be done once in two weeks at least.

Kerosene is sometimes used as a wash for this purpose, but it is liable to remove the hair along with the eggs.

There is another kind of bot-fly that deposits its eggs upon the lips and margins of the nostrils and on the hairs

beneath the throat. To remove the eggs from the lips and edges of nostrils, the carbolic acid and water should be used. The eggs beneath the throat can be scraped off.

SCREW-WORM FLY.

(*Compsomyia* (*Lucilia*) *macellaria*. Fab.)

The Screw-worm Fly deposits its eggs in cuts, bruises, scratches, or in fact in wounds of any kind, on the bodies of animals. Even the blood which has exuded from a crushed tick furnishes a place for the fly to deposit its eggs. In many cases eggs are frequently found in the sheathes of mules and horses and in the navels of young stock. The injuries inflicted by the maggots which hatch from these eggs have caused the insect to be looked upon as a serious pest.

Preventives.—In the first place all garbage and refuse matter, such as dead carcases of animals and dead vegetable material, should be burned or buried, because these substances furnish breeding places for the fly and food for the maggots. In the second place, stock should be carefully examined every day to see if they are cut or bruised. If so, the cuts and bruises should be covered with a coat of pine tar, which will prevent the fly from depositing its eggs and also assist in healing the wound. If the wound is situated so that a cloth can be wound about it, this should be done. In most cases the wounds will need more than one application of the tar. If possible stock should be kept away from all barbed wire fences. Finally it is very important that the stock be free from ticks, because the puncture made by the ticks afford an opening in the skin in which the fly will deposit its eggs.

Remedies.—For sores infested with the maggots crude carbolic acid, 1 part to 30 parts of water, is the best remedy known. It not only kills the maggots, but it aids greatly in healing the wound. After having thoroughly washed out the wound with the mixture of water and carbolic acid, apply a coat of pine tar, which will prevent a later deposit of eggs. In case of a deep hollow wound,

some lint cotton coated with tar might well be inserted in the cavity. Calomel has also proved a good remedy. But care should be taken not to apply it in too large quantities, else it will retard if not prevent the wound from healing by over-stimulating it. Moreover, if within reach of the animal's tongue, the calomel will be licked off and may cause mercurialism.

Dr. Francis says that creoline, or any of the carbolic sheep dips, forced into the wound by a common machine oil-can, holding about 4 ounces, is a very cheap and satisfactory method of killing the maggots.

Animals can be protected from the adult fly by being coated with a mixture of tar and grease or fish oil alone. So long as the odor lasts the fly does not seem to deposit her eggs.

SHEEP BOT-FLY OR HEAD MAGGOT.

(*Oestrus ovis.* Linn.)

Although for a long time it was thought that this fly deposited only eggs, it is now well established that in most cases it deposits living maggots in the nostrils of the sheep, which ascend to the small intricate cavities of the head.

Methods of Prevention.—It is a common practice for sheep-raisers to bore holes 2 inches in diameter and 5 or 6 inches apart, in logs which are placed in some convenient part of the pasture. The holes are just deep enough for the sheep to reach the salt which is placed therein. Tar is then placed about the edges of the holes so that the nostrils of the sheep are smeared with it as they eat the salt. The tar, the odor of which seems to repel the fly, should be applied to the logs once in 4 or 5 days.

Others have a practice of plowing a small part of the pasture so that the sheep may thrust their noses into the fresh dirt and thus prevent the fly from depositing the maggots. This might be effectual if the sheep could stand in this position all the time, but as soon as it leaves the plowed ground the persistent fly finds its opportunity.

Dislodging the Grubs.—A feather dipped in turpentine may be run up the nostrils and quickly turned two or three times. This will dislodge the grubs within its reach.

The sheep should be forced to sniff dry lime up the nostrils which will cause them to sneeze violently and thus dislodge some of the grubs.

A wire should never, under any circumstances, be run up the nostrils of the animals. But very few of the grubs could be hit in this way, and besides it will cause the most excruciating pain to the animal. If one has ever had a dentist bore away at the free end of a nerve in a tooth, he can get some idea of the awful pain that will be produced by a wire penetrating the delicate membranes of a sheep's nostrils.

OX BOT-FLY OR WARBLE FLY.

(*Hypoderma bovis.* DeG.)

The larva or maggot of this fly is the one so often found beneath the skin along the backs of cattle. They are the little lumps found along each side of the backbone and are known as "warbles" or "wolves." There is no doubt but that this insect causes more damage than is generally supposed. The hides which are perforated by the "warbles" sell for less on that account, and also the beef of cattle affected by these maggots does not command so high a price. The expense of holding this pest in check would be infinitely small compared with the financial loss by damage to hides and beef, to say nothing of the annoyance to cattle.

Methods of Destroying the Maggots.—The maggots can be squeezed out in the spring with the thumb and forefinger. If the hole leading from the "warble" to the outside is too small, it may be enlarged by a blunt round stick. Cattle which are kept in stables should be examined and whenever a lump is found along the back the warble should be squeezed out. If this is done during late spring, the maggots should be killed after they are pressed out so as to be sure they do not turn to flies.

Another and simpler method is to smear the back of the animal with any thick greasy substance. Fish oil, lard oil, or even kerosene, rubbed into the places where the "warble" occurs will kill it. The thick substances fill up the holes leading to the maggot, and this excludes the air until finally the maggot dies.

If every farmer in a neighborhood would practice these methods thoroughly and persistently the pest could be almost exterminated in that particular region.

MISSISSIPPI AGRICULTURAL

EXPERIMENT STATION.

BULLETIN No. 54. MARCH, 1899.

IRISH POTATO CULTURE.

BY A. B. McKAY.

The Irish potato is grown in every state in the Union. It is a staple in the markets the year round, and too many of us have grown to depend on our markets for a part, if not all, of the potatoes we consume. Here and there in this state is found a man, who, for twenty or more years past, has not failed to harvest a spring crop; and who seldom fails with his fall crop. Like every other vegetable, the Irish potato will succeed much better on some soils than on others; yet I venture the statement that there is scarcely a village garden or a farm worth living on, in the state of Mississippi, on which there is not a plot of land which, with the little necessary attention given, will not yield all the potatoes that can profitably be consumed on the place, and at less than half the price asked in the markets.

This bulletin is written not so much for the experienced grower as for the villager and the farmer who should grow their potatoes at home.

U. S. Plant Introduction Garden, Chico, C

Under favorable conditions, two crops may be grown in this lattitude each year. As the treatment of the first, or spring crop, differs somewhat from that of the second, or fall crop, we will discuss them separately, giving attention first to the

SPRING CROP.

SOIL.

A deep, loamy, warm, fertile soil is preferred. In the absence of such requisites the grower should choose one that nearest fills the description. A loamy soil, overlying a porous clay subsoil is better than the same soil over a gravel or sand bed. Light soils, that is, such as are easily moved by the plow are less difficult to cultivate and more conducive to an early harvest than are heavy, compact soils.

DRAINAGE.

No matter what the character of the soil—light or heavy, poor or rich in necessary plant food—thorough drainage is essential to the best success with Irish potatoes. Shortly after a continued, heavy rainfall dig a hole in the ground about fifteen inches deep. The distance to which water will rise in this hole will show the distance below the surface of the ground beyond which the roots of plants will be as effectually submerged in water as if lowered beneath the surface in a tub filled with the same liquid. If the water level is gradually lowered, so that within twenty-four to thirty-six hours after rain has ceased, no water stands over the bottom of the hole, no artificial drainage is needed. If, on the other hand, water sinks much more slowly, open surface drains, properly placed, should remedy the trouble.

A properly drained soil warms quicker in the spring, retains water necessary for the development of plants longer, admits more air and gives far better results from plant food already in the soil, to say nothing of that added in fertilizers, than does a poorly drained soil.

The condition and character of the land must determine

the time and the method of plowing. If heavy and compact, stir as deeply as possible during the late fall or early winter, before the soil has become too wet to crumble nicely. Probably nothing connected with success in growing Irish potatoes is of greater importance than the matter of securing a deep, mellow bed for the growth of roots. In the matter of drainage, deep plowing and subsoiling of close, compact soils aid materially. In the absence of any other pattern a Brinley plow, with the moldboard, or wing, removed, makes an excellent subsoil plow. If plowing is done at the time indicated, the turning plow may be set sufficiently deep to bring a little subsoil to the surface. (In this sense we use the term "subsoil" to mean that which lies immediately below the depth to which the turning plow has previously stirred the soil). The subsoiler should follow immediately behind the turning plow, cutting in the bottom of the open furrow to as great a depth as the strength of the team will permit. Soil inclined to become wet from excessive rainfall should be left in high, narrow ridges or rows, just the width intended for the potato rows. If the strips, or furrows, are so made that the soil broken by the turning plow will be left edged up rather than turned over, a better exposure will be given; and alternate freezing and thawing during the winter will do much to disintegrate the soil and render more plant food available. Left in this loose, open condition during the winter, the soil will warm up quicker in the spring, drainage will be better and planting may be done earlier than if the land had been harrowed down level. Deep sandy loam soils or soils overlying porous subsoil, may be plowed in broad flat beds during the fall; or, plowing may be deferred altogether until shortly before planting time. Possibly such soils will not be benefited by subsoiling.

PLOWING AND SUBSOILING.

With proper care given to preparation and cultivation, many soils will produce a good yield of potatoes without the aid of fertilizers; yet we seldom find one to which fertilizers, if intelligently applied, may not be added with

profitable results. It is not good economy to purchase fertilizers when the elements of the plant food sought may be collected at home and put in proper shape for the plant at a price less than that asked in the market. Fresh, dry ashes, especially from hard wood, are rich in potash. Decayed leaves, black dirt from about old logs, the scrapings from old chip piles and from the fowl house, contain the elements needed; and when these materials have been thoroughly mixed together and have lain for some weeks in a pile, the resulting compost will be rich in available plant food. Some growers object to barnyard manure for the Irish potato; but, if it is spread on the soil a month or six weeks before planting time, or else composted with the materials named above in time to become well rotted before planting season, the objectionable features are, in a measure, remedied. In barnyard manure we have a complete fertilizer, that is, one that containes Nitrogen, Phosphoric Acid and Potash—the three elements of plant food lacking in most soils. Cottonseed is also a complete fertilizer, and gives good results with potatoes when used alone. Acid Phosphate in combination with cottonseed or with cottonseed meal gives the best results on the majority of loam soils in this State. In a limited teritory, on soils similar to the poor sandy section near the Gulf Coast, a special fertilizer rich in potash might be best for the potato. Now, as to the amounts that may be profitably used to an acre of land, I would suggest about the following:

FERTILIZERS AND THEIR APPLICATION.

Compost, of the materials collected at home, made as indicated above, depending upon the composition of the heap, 30 to 75 wagon loads per acre.

Cottonseed used alone, 1500 to 2000 pounds per acre.

Cottonseed, 1500 lbs. and Acid Phosphate 750 lbs. = 2250 pounds per acre.

Cottonseed meal 750 lbs. and Acid Phosphate 750 lbs.= 1500 pounds per acre.

To any one of the last three amounts named above may be added from 200 lbs. to 500 lbs. of Kainit, where the fertilizers are to be applied to sandy lands.

As to the application of fertilzers. In the use of compost as indicated above, or where whole cottonseed is

used, something like half should be applied in the drill beneath the potatoes, several weeks before planting; the remainder at planting time, placing the fertilizer just above and to each side of the potatoes, after they have been partially covered. Where crushed cotton seed or cottonseed meal and acid phosphate are used, apply, say, two-thirds at planting time, half the amount over and half under the potatoes; the remainding third on each side of the row at the first working.

The time for planting will vary with the latitude, weather conditions and the soil, In the southern part of the State warm, sandy soils may be planted early in February. Throughout the middle and the northern portions, the time will range all the way from February 15th to March 10th. Nothing is gained by planting before we are reasonably sure that the worst winter weather is past.

TIME AND METHOD OF PLANTING.

It is well to cut seed potatoes a day or two before planting, so as to give the cut surfaces time to dry. In cutting see that each piece carries at least one eye, or bud. In size, each piece should be from about one fourth to one third that of a hen egg, or about one ounce in weight. Each piece should contain as much of the central portion of the tuber as possible. In no case should the heart of the potato be left, as is practice with some, for the table. Each piece contains necessary food for the sustenance of the plant until it is able to feed from the soil.

Planting should be done in freshly prepared land. Rows should be thirty to thirty-six inches apart; pieces of potato, one in a place, about one foot apart in the row. Depth of planting will depend upon circumstances.

In a loamy, well drained soil five inches deep, the surface harrowed down level, might be admissible; but on heavy soils, or with such as do not handle water readily, the rows should be nicely rounded and the depth should not exceed three to four inches.

With proper care in preparation of the soil and in planting, cultivation becomes simple and inexpensive. In land inclined to crust after hard rains, cultivation should be

more frequent than in loamy soils. It is advisable to run a light harrow over the rows just before the plants make their appearance, and again a week later, to assist them in coming up and to keep down grass and weeds. Shallow and frequent cultivation is best. The ground should not be stirred below the depth of three or four inches, The harrow mentioned and a Planet Jr. or any other good cultivator, are the only implements needed on light, well drained soils. The sweep is needed in keeping the rows properly rounded in heavy soils that refuse to rid themselves quickly of surplus water.

CULTIVATION.

Under favorable sonditions, plantings made March 1st, should mature potatoes sufficiently large for the table early in May. If carefully done, a few of the largest potatoes may be taken from the hills without injury to the vines or to the smaller potatoes that remain. With a small paddle or a carving fork, remove the soil that lies immediately over the potatoes; and after taking out such as are wanted (not disturbing the others), replace the dirt and firm it down. If wanted for market, the trucker frequently finds it to his interest to dig and ship before the potatoes are fully matured, the loss in yield being overbalanced by the difference of price in favor ot early shipments. For first early shipments bushel crates are frequently preferred to the regular potato barrel. When the three-bushel barrel is selling at $4.00 to $4.50 I have seen the bushel crate sell at $2.00. No matter what packages are used they should be clean, neatly made, and well ventillated. No blemished potatoes should be shipped. Grade carefully, making first and second sizes. Grading should be done as the potatoes are being picked up from the ground. Handle as little and as carefully as possible, and pack as the potatoes are being dug. They should be so well placed and settled down in each package that upon shaking after it is closed, scarcely a potato will change its position in the package. Where early marketing is not an object, digging should be deferred until the vines are pretty well wilted. Only those who grow potatoes for a series of years and on a large scale can afford a harvester. The most expeditious method of digging, with the average grower, is to run one turning-plow furrow on each side of the row as close to the plants as possible without throwing potatoes over and covering with dirt;

HARVESTING.

and then follow with potato forks raking the tubers out from the narrow strips left between the open furrows.

KEEPING DURING SUMMER.

If exposed to the hot sun a few hours Irish potatoes will become blistered. To prevent this, dig on clondy days or else arrange to remove to a shady place or cover in some way shortly after they are dug. Several methods of keeping potatoes during the hot summer months are practiced, and with varying success. Upon examination it will be found that, as a rule, those left in the field, scattered through the soil keep better than those that are carefully housed. Taking this lesson from nature we have tried the method of bedding the potatoes in the field, somewhat after the usual plan of bedding sweet potatoes for growing slips, and with good success. We are careful to see that the potatoes are covered to the depth of six or seven inches with dirt, and that the bed is well drained. We have practiced the same method of bedding the potatoes in the shade of spreading trees, and on the cellar floor. A cool, shady situation is better than the open field. We have had much better success with potatoes covered with soil than with those spread out in open air in the cellar, or under trees where we covered with leaves. In no event should the potatoes be piled or heaped together, so long as warm weather continues. If potatoes intended for the table are exposed to the light for any considerable length of time they will turn greenish in color and become unwholesome for food. If not spread in a dark place they should be covered with leaves, straw or dirt.

FALL CROP.

A cool, moist soil, rather than one that is hot and dry, is conducive to to the best success with the second crop. What is termed "second bottom" land more nearly approaches these conditions than the high dryer hill sides. Land that was thoroughly prepared, highly fertilized and cultivated in some spring crops like onions and cabbage, is better than that broken and fertilized only a short time before planting. In order to retain a good amount of water the soil should be finely pulverized. If plowed and harrowed immediately after the spring crop is off it will be better than to wait until the approach of planting time. Large quantities of fresh barnyard manure, or any other

materials that will generate heat, are not advisable. If the land is rich in vegetable mould cottonseed meal and acid phosphate may be applied liberally.

August 1st, to 15th, is the time to plant. As the conditions for germination, or starting the buds, are less favorable during August than during March, it is usually best to start the buds into growth before planting. This requires two or three weeks time, and is easily done. Spread in a cool, shady place, cover three or four inches with sand or loamy soil, and keep well moistened but not wet. When the sprouts are from a quarter to a half an inch long, cut, let dry a few hours and plant. Pieces on which the eyes have not started may be left in the bed a few days longer. As the plants must depend on the substance in the piece of tuber for food until it is sufficiently developed to draw from the soil what it needs, it is best to cut in larger pieces than was advised for spring planting; but for the large quantity of seed potatoes necessary, it would doubtless be better, in the end, not to cut a potato that is smaller than a guinea egg. Cover immediately after potatoes are dropped. Rows, distance between hills in the row, and cultivation, is the same as was advised for spring planting. If well drained, plants will grow off better if the pieces are dropped in open furrows five or six inches below the general level, and not more than four inches of soils over them at first, but as we never know when a continued wet spell may happen between the time of planting and the date when the plants should be a few inches above the surface, and out of danger, we must take the risk of loosing all if we plant below the level in soil (like much of our richest potato soils are in Mississippi) that refuse to rid themselves quickly of surplus water. Harvest during latter part of November, or any time before freezing weather. Fall grown potatoes keep without any trouble. It is only necessary to take proper care in digging, and to store in barrels, boxes, or in piles, in a cool dark place, where they will not freeze.

As to varieties, a potato that succeeds in one latitude and soil is not, necessarily, a success in another. Among the varieties that seem to give the best results, so far as they have been tried in this State, I name, in order of value; Early Rose, Peerless, Red Triunph and Beauty of Hebron. The Triumph usually brings the highest price in the market; the Peerless is the latest and perhaps the best able potato of the four varieties named.

EXPERIMENT STATION

—OF THE—

MISSISSIPPI

Agricultural and Mechanical College

BULLETIN NO. 55.

ANALYSES OF

COMMERCIAL FERTILIZERS

ON SALE IN THE STATE.

AGRICULTURAL COLLEGE, MISS.,

March 15th, 1899.

Mississippi Fertilizer Control.

INSPECTION AND ANALYSES OF FERTILIZERS

BY THE CHEMICAL DEPARTMENT OF THE

MISSISSIPPI AGRICULTURAL AND MECHANICAL COLLEGE.

B. W. KILGORE, State Chemist.
W. F. HAND, Assistant Chemist.
E. W. MAGRUDER, Ass't. Chemist.
J. S. CARROLL, Ass't. Chemist.

The analyses presented in this bulletin are of samples of fertilizers collected by the fertilizer inspector of this department. The samples were taken during February and March from goods in the hands of fertilizer dealers, and therefore represent the composition of the goods the farmers *are buying or will buy.*

This is the third edition of the fertilizer bulletin for this season—1898-99. From now on till the end of the growing season the fertilizer inspector will make frequent trips over the portion of the State where fertilizers are used and collect samples from goods in the dealers' hands. These samples will be analyzed as promptly as possible

NOTE.—The analysis and inspection of commercial fertilizers is by law done by the Professor of Chemistry at the College, who is State Chemist. The results being considered of agricultural value are sent out by the Experiment Station. All communications in regard to these Bulletins or analyses should be addressed to State Chemist.

and the results published for the benefit of those interested in them. It is proposed to send out the fourth bulletin April 15th, and the fifth, to include all the work of the season, some time during the summer. *These bulletins will be sent free to any person requesting them.*

TERMS USED IN ANALYSES.

Nitrogen, Phosphoric Acid, and Potash are the three constituents in a fertilizer which give to it its value. They do not make up all of a fertilizer—in fact, in most fertilizers other constituents are present in larger quantities than are these—but they are the only ones to which values need be assigned. The amounts of these constituents found in the fertilizers analyzed are expressed in the table as percentages or pounds in one hundred pounds of the fertilizer.

Four columns are given to Phosphoric Acid. In the first is found the water-soluble phosphoric acid, or the portion dissolved by cold water; in the second one is found the citrate-soluble, or the portion soluble in ammonium citrate solution; in the third, the portion not soluble in either water or citrate solution, but soluble in strong acid; in the fourth column is given the total phosphoric acid, or the sum of the preceding forms. The water-soluble and citrate-soluble represent the phosphoric acid immediately available for plant growth.

Two sets of percentages are given in table I, "found" and "guaranteed." The percentages found represent the results actually obtained in the analysis of the fertilizers, while the guaranteed percentages are what the manufacturers claim them to contain.

VALUATIONS.

In order to have a basis of comparison for the different fertilizers, values are assigned to the three valuable ingredients—nitrogen, phosphoric acid, and potash. These valuations are not intended to represent *crop producing power or agricultural value*, but are *estimates of the commercial value* of nitrogen, phosphoric acid, and potash in the materials supplying them. While the valuations are only approximate, it is believed that they fairly represent the cost of making and putting the fertilizers on the market. They are based upon a careful examination of the trade conditions, wholesale and retail, and upon quotations from manufacturers.

The figures used in calculating the "relative value per ton" in this bulletin are the same as those used last season, and are as follows:

	per pound.
For Nitrogen	12.5 cents
For potash	5 cents
For water-soluble phosphoric acid in mixed fertilizers	5 cents
For water-soluble phosphoric acid in unmixed acid phosphates	4.5 cents
For citrate-soluble phosphoric acid in mixed fertilizers	4.5 cents
For citrate-soluble phosphoric acid in unmixed acid phosphates	4 cents
For phosphoric acid in fine ground bone	3 cents
For phosphoric acid in medium and coarse bone	2.5 cents

All relative values during this season will be calculated by the use of these figures.

HOW RELATIVE VALUES ARE CALCULATED.

It may not be clear to all how values per ton are calculated. To make this plain an example is given. It is to be remembered that the figures in the table represent pounds and parts of a pound of nitrogen, phosphoric acid, and potash in one hundred pounds of the fertilizer, and that there are twenty hundred pounds in one ton (2,000 pounds.)

The calculation is made as follows:

Percentage or lbs. in 100.	Val. per 100 lbs.	Val. per ton (2,000 lbs.)
6 lbs. Water-sol. phos. acid at 5c per lb.	$0.30 x 20 =	$ 6 00
2 lbs. Citrate-sol. phos. acid at 4½c. per lb	0.09 x 20 =	1 80
2 lbs. Nitrogen at 12½ cents per pound...	0.25 x 20 =	5 00
2 lbs. Potash at 5 cents per pound.....	0.10 x 20 =	2 00
Total value.....	$0.74 x 20 =	$ 14.80

DATA IN THE TABLES.

The data in the tables will be readily understood. In table I will be found the analyses of samples collected this season. These goods are now on sale, and the analyses should receive careful study, as they show the character of the fertilizers being offered to the farmers. Several analyses are given of some of the brands, together with the dealers selling them, and under the analyses will be found the guarantees made by the manufacturers. A comparison of these will show how well the goods agree with the claims made for them.

TABLE II.

In table II will be found a list of the brands of fertilizers registered and legally on sale in the State, together with the guaranteed composition of the brands, and the relative values per ton calculated from these guarantees. Analyses of a number of these brands have not yet been made as samples of the goods have not been obtained.

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	Armour Packing Company, Kansas City, Mo.	
1037	FERTILIZER NO. 271.....	W. L. Wellman, Wesson..... Guarantee.....
	Birmingham Fertilizer Company. Birmingham, Ala.	
1038	PROLIFIC ACID PHOS'TE.	Threefoot, Bros.&Co., Meridian Guarantee.....
	BIRMINGHAM HIGH GRDE	
1024	FERTILIZER.....	Gilmore & May, Amory.....
1090	" " "	Gilmore & May, Amory..... Guarantee.....
	Capital Fertilizer Company, Jackson, Miss.	
	HIGH GRADE ACID PHOS-	
970	PHATE.....	I. M. Eagan, Crystal Springs..
1066	" " " " ..	Waddell, May & Barnes, Brandon
1095	" " " " ..	A. E. Kelly, Kosciusko..... Guarantee.....
1039	KAINIT.....	W. C. Wilkinson, Crystal Sprgs Guarantee.....
1026	MISS. STATE GRANGE...	Max Priebatsch, Brookhaven.. Guarantee.....
971	NONPAREIL.....	E. L. Scott, Summit.....
972	"	M. J. L. Hoye's Sons, Newton.
973	"	Becker, Lyell & McGrath Co. Ws'n
1096	"	J. H. Eddleman, Wiers..... Guarantee.....
975	OUR VEGETABLE GROW'R	Hutchison&Co., Crystal Sprn'g's
1067	" " "	Ford Bros. Co., Centreville.... Guarantee.....
974	RED STAR.....	Wm. Atkinson & McDonald, Ws'n.
1040	"	W. C. Ellis, Steen's Creek..... Guarantee.....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water-Soluble	Citrate-Soluble.	Insoluble.	Total.			
1037	5.90	3.52	4.98	.61	9.11	1.88	1.19	$13.89
.....	... ..	*5.00*	*2.00*	*1.50*	*8.50*	*1.50*	*1.00*	*11.55*
1038	11.56	10.54	1.94	2.92	15.40	.....	.....	11.04
....	.....	*11.00*	*2.00*	*1.50*	*14.50*	.....	.....	*11.50*
1024	11.82	6.93	1.54	3.22	11.69	1.80	2.41	15.22
1090	15.19	9.43	1.04	.62	11.09	1.99	2.79	18.13
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.64*	*2.00*	*14.00*
970	12.15	10.77	2.59	.44	13.80	.....	.....	11.77
1066	14.38	11.17	2.22	.50	13.89	.....	.....	11.83
1095	10.05	7.80	5.12	.67	13.59	.....	.....	11.12
....	.....	*10.00*	*2.00*	*.50*	*12.50*	.....	.....	*10.60*
1039	5.71	.....	....	.....	.....	.....	12.74	12.74
....	.....	.....	.....	.....	.....	.....	*12 00*	*12.00*
1026	12.82	7.11	2.48	.51	10.10	1.60	1.76	15.10
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.50*	*2.00*	*14.55*
971	12.77	6.73	2.92	.43	10.08	1.50	2.15	15.26
972	10.73	8.06	2.36	.46	10.88	1.58	2.09	16.22
973	12.53	6.92	2.49	.49	9.90	1.58	2.23	15.34
1096	10.17	7.23	2.72	.31	10.26	1.57	2.16	15.76
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.50*	*2.00*	*14.55*
975	9.05	5.10	2.45	.37	7.92	2.49	6.22	19.75
1067	10.09	5.51	2.74	.42	8.67	2.56	6.24	20.62
....	.....	*6.00*	*2.00*	*1.00*	*9.00*	*2.25*	*3.50*	*16.93*
974	14.10	6.94	2.51	.68	10.13	1.63	1.98	15.25
1040	12.04	7.48	2.19	.36	10.03	1.83	2.23	16.26
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.50*	*2.00*	*14.55*

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	Continental Fertilizer Company, Nashville, Tenn.	
1078	SUNNY SOUTH ACID PHO.	J. A. Mehaffey, Steenton..... Guarantee .....
1079	EDDYSTONE SOL. GUANO	J. A. Mehaffey, Columbus..... Guarantee .....
	The Goulding Fert. Company, Ltd. Pensacola, Fla.	
1083	GOULDING'S H. G. ACID PHOSPHATE	D. D. Richardson, Columbus... Guarantee .....
	Jackson Fertilizer Company, Jackson, Miss.	
976	HIGH GRADE ACID PHOSPHATE	W. H. Chambliss, Newton.....
1068	" "	Lotterhos&Huber, Crystal S'pgs Guarantee .....
1027	GULF STATES GUANO..	Mayes & Berry, Hazlehurst....
1097	" " "	T. C. Simmons, Magnolia..... Guarantee .....
1036	ROYAL C.....	The Mills-Evans Co., McComb.
977	"	Earns, Long & Co., Wesson....
978	"	W. H. Chambliss, Newton.....
1069	"	Gallman Mer. Co., Gallman.... Guarantee .....
979	VEGETABLE AND FRUIT. FERTILIZER.....	Lotterhos & Huber, Crystal Sp. Guarantee .....
	Sold by **Marbach & Eagan,** Crystal Springs, Miss.	
980	BAT GUANO.....	I. M. Eagan, Crystal Springs..
1047	" "	P. H. Traweek, Gallman..... Guarantee .....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Val. Per Ton.
		Water-Soluble.	Citrate-Soluble.	Insoluble.	Total.			
1078	10.56	11.69	2.23	.33	14.25	.....	.....	$12.30
....	.....	*10.00*	*3.00*	*1.00*	*14.00*	.....	.....	*11.40*
1079	8.61	7.54	3.12	1.18	11.84	1.57	1.26	15.53
....	.....	*7.00*	*2.00*	*1.00*	*10.00*	*1.65*	*1.00*	*13.93*
1083	12.34	12.09	4.67	2.23	18.99	.....	.....	14.61
....	.....	*12.00*	*3.00*	*1.00*	*16.00*	.....	.....	*13.20*
976	12.03	11.53	1.92	.97	14.42	.....	.....	11.91
1068	11.84	10.54	2.58	.74	13.84	.....	.....	11.55
....	.....	*10.00*	*2.00*	*2.00*	*14.00*	.....	.....	*10.60*
1027	22.42	7.18	1.88	1.88	10.94	1.65	1.80	14.80
1097	16.69	7.64	2.92	.73	11.29	1.74	1.80	16.42
....	.....	*6.00*	*1.60*	*1.00*	*8.60*	*1.55*	*1.80*	*13.12*
1036	21.85	7.15	2.20	1.88	11.23	1.61	1.67	14.83
977	22.35	7.27	2.57	.32	10.16	1.78	1.95	15.98
978	20.14	7.40	2.22	.67	10.59	1.70	1.90	15.55
1069	20.55	7.07	2.40	1.92	11.39	1.71	1.89	15.39
....	.....	*6.00*	*1.60*	*1.00*	*8.60*	*1.55*	*1.80*	*13.12*
979	16.46	5.07	2.06	.36	7.49	3.26	4.47	19.54
....	.....	*3.00*	*3.00*	*1.00*	*7.00*	*3.00*	*4.00*	*17.20*
980	18.35	.....	.....	.....	6.59	4,96	1.19	17.53
1047	25.28	.....	.....	.....	7·35	4.12	93	15.64
....	.....	.....	.....	.....	*5.00*	*4.25*	*.65*	*14.28*

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	A. D. Adair & McCarty Bros., Atlanta, Ga.	
1080	BUFFALO BONE FERT'ZR	J. I. Hopkins, Iuka..... Guarantee .....
1082	FURMAN'S H. G. DIS.BNE	J. I. Hopkins, Iuka..... Guarantee .....
1081	FURMAN'S SOL. BONE WITH AM. & POTASH..	J. A. Mehaffey, Columbus..... Guarantee .....
	Meridian Fertilizer Factory, Meridian, Miss.	
1029	MERIDIAN BLOOD &BONE	A. E. Dalrymple, Amory.....
1042	" " "	Holmes Bros., McComb City...
1101	" " "	T. W. Ford, Eupora..... Guarantee .....
1028	ENGLISH ACID PHOS'ATE	A. E. Dalrymple, Amory.....
1041	" " "	Bonner Bros., Sandersville.... Guarantee .....
986	MERIDIAN ACID PHOS'TE	W. B. Richardson, Newton ....
1043	" " " ..	Phillips, Hinds&Co.. Booneville
1089	" " " ..	Lann&CarterHdw.Co.,Aberde'n
1102	" " " ..	O. B. Cook, Maben..... Guarantee .....
1030	MERIDIAN FARMER'S FRIEND.....	S. Cohn & Sons, Magnolia..... Guarantee .....
981	KAINIT.....	W.H.Barron & Co.. Crystal Sps. Guarantee .....
982	MERIDIAN HOME MIX'RE	J.McGrath&Sons, Brookhaven.
983	" " " ..	Walton, Gillaspy&Russell,H'ky
984	" " " ..	J. P. Myer, Ellisville.....
1044	" " " ..	J. L. Miller, Gallman.....
1070	" " " ..	W. J. Bell, Pelahatchie..... Guarantee .....

Laboratory Number	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value per Ton.
		Water-Soluble.	Citrate-Soluble.	Insoluble.	Total.			
1080	12.62	8.70	1.29	1.28	11.27	1.72	2.04	$16.20
....	.....	*6.00*	*3.00*	*2.00*	*11.00*	*1.75*	*2.00*	*15.08*
1082	11.85	9.93	2.05	.37	12.35	.....	.....	10.58
....	.....	*8.00*	*4.00*	*2.00*	*14.00*	.....	.....	*10.40*
1081	13.14	9.01	1.80	1.23	12.04	.96	1.34	14.37
....	.....	*6.00*	*4.00*	*2.00*	*12.00*	*.85*	*1.00*	*12.73*
1029	15.99	8.80	2.45	2.89	14.22	1.42	1.61	16 36
1042	17.26	8.31	2.92	1.32	12.54	1.48	1.78	16.42
1101	13.77	8.53	2.93	2.38	13.84	1.63	1.55	16.79
....	.....	*7.75*	*2.00*	*2.50*	*12.25*	*1.65*	*1.85*	*15.53*
1028	15.27	11.46	3.55	.54	15.55	.....	.....	13.16
1041	15.87	11.58	3.12	.78	15.48	.....	.....	12.92
....	.....	*10.00*	*2.50*	*.50*	*13.00*	.....	.....	*11.00*
986	15.99	13.37	1.94	.49	15.80	.....	.....	13.59
1043	16.08	11.58	2.75	.81	15.14	.....	.....	12.62
1089	15.79	12.06	3.42	.60	16.08	.....	.....	13.59
1102	12.68	12.31	4.01	.70	17.02	.....	.....	14.29
....	.....	*12.06*	*2.50*	*1.00*	*15.50*	.....	.....	*12.80*
1030	15.48	9.21	2.06	1.05	12.32	1.41	2.11	16.70
....	.....	*8.00*	*2.50*	*1.00*	*11.50*	*1.25*	*1.50*	*14.88*
981	3.71	.....	.....	.....	.....	.....	13.02	13.02
....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
982	12.17	8.45	3.01	.81	12.27	1·75	2.11	17.64
983	13.22	8.25	2.35	1.04	11.64	2.81	2.28	19.67
984	13.12	8.02	2.12	.75	10.89	1.76	2.18	16.51
1044	11.50	8.37	2.54	.47	11.38	1.68	1.91	16.77
1070	13.67	7.45	2.00	.41	9.86	1.90	2.24	16.24
....	.....	*7.75*	*2.00*	*1.00*	*10.75*	*1.75*	*1.85*	*15.78*

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
985	MERIDIAN SOL'E GUANO	Wm. Atkinson&McDonald, Ws'n
		Guarantee .....
	MERIDIAN VEGETABLE	Hattiesburg Compress Co., Hbg
1045	GROWER	Guarantee.....
	Mobile Phosphate & Chemical Co., Mobile, Ala.	
1010	I.X.L. ACID PHOSPHATE	W. J. Hubbard, Shuqualak....
987	" " " "	Winner & Meyer, Meridian....
1071	" " " "	J. E. Buckley, Enterprise.....
1103	" " " "	Thomas & Hartley, Maben.....
1046	" " " "	S. J. Johnson, Ellisville.....
		Guarantee .....
1031	ECLIPSE SOL. GUANO...	J. M. Stephenson, Morton.....
1104	" " " "	Grunewald&Loewenbery, McCl
		Guarantee .....
1105	K.K.K. AM. SOL. BONE.	W. B. Potts Co., Kosciusko ...
1106	" " " "	Seward & Gaston, Ackerman..
		Guarantee .....
1006	MOBILE STANDARD.....	W. J. Hubbard, Shuqualak....
989	" "	Winner & Meyer, Meridian....
1072	" "	J. L. Wells, Hickory.....
1107	" "	J. N. Alexander, Kosciusko....
		Guarantee .....
988	KAINIT...	Winner & Meyer, Meridian....
		Guarantee.....
	New Orleans Acid and Fertilizer Co., New Orleans, La.	
1048	BLK. DIAMOND ACID PH.	Robinson Mer. Co., Centreville.
1032	" " " "	G. W. Walton, Hickory.....
		Guarantee .....
990	BLOOD, BONE, & POTASH	Louis Cohn&Bros., Brookhaven
		Guarantee.....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water-Soluble.	Citrate-Soluble.	Insoluble.	Total.			
985	13.84	6.64	3.21	.86	10.71	1.74	2.19	$16.07
....	.....	*7.75*	*2.00*	*1.00*	*10.75*	*1.75*	*1.85*	*15.78*
1045	10.75	5.99	2.34	.65	8.98	2.69	6.25	21.07
....	.....	*5.00*	*1.00*	*.50*	*6.50*	*2.50*	*6.00*	*18.15*
1010	16.24	13.96	1.98	.24	16.18	.....	.....	14.19
987	13.29	13.05	3.04	.58	16.67	.....	.....	14.18
1071	14.58	10.46	3.18	.24	13.88	.....	.....	11.96
1103	11.83	11.41	3.02	1.42	15.85	.....	.....	12.69
1046	14.31	11.16	2.26	.63	14.05	.....	.....	11.84
....	.....	*10.00*	*2.00*	*1.50*	*13.50*	.....	.....	*10.60*
1031	10.77	5.48	2.73	3.74	11.95	1.65	1.72	13.78
1104	8.89	4.77	3.51	3.24	11.52	1.80	1.94	14.37
....	.....	*6.00*	*2.00*	*1.50*	*9.50*	*1.65*	*2.00*	*13.93*
1105	12.55	7.78	3.92	2.33	14.03	1.10	1.25	15.31
1106	10.44	6.84	4.36	1.87	13.07	.92	.78	13.85
....	.....	*8.75*	*1.25*	*1.50*	*11.50*	*.85*	*1.00*	*13.00*
1006	13.61	7.37	1.65	4.01	13.03	1.98	2.15	15.95
989	11.92	6.82	2.88	2.84	12.54	1.74	2.09	15.85
1072	13.42	5.10	4.47	.99	10.56	1.96	1.95	15.97
1107	9.49	4.48	3.40	3.11	10.99	1.79	1.91	13.93
....	.....	*6.00*	*2.00*	*1.50*	*9.50*	*1.65*	*2.00*	*13.93*
988	4.86	.....	.....	.....	.....	.....	11.92	11.92
....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1048	16.08	12.98	1.62	1.65	16.25	.....	.....	12.98
1032	15.91	12.79	1.50	1.92	16.21	.....	.....	12.71
....	.....	*11.00*	*2.00*	*2.00*	*15.00*	.....	.....	*11.50*
990	12.49	6.82	2.35	4.77	13.94	1.77	2.11	15.47
....	.....	*7.50*	*2.50*	*2.00*	*12.00*	*1.75*	*1.00*	*15.13*

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
1073	DISSOLVED BONE.....	Hawkins & Co., Hattiesburg...
		Guarantee .....
991	GOLDSMITH'S IMP. MIXT.	Louis Cohn&Bros., Brookhaven
992	" "	Earns, Long & Co., Wesson...
1049	" "	Peets & Norman Co., Hazlehurst
		Guarantee.....
1050	KAINIT.....	Robinson Mer. Co., Centerville.
		Guarantee .....
	Planters' Fertilizer Company, New Orleans, La.	
1051	COTTON AND CORN.....	Boyd & Lee, Wesson.....
		Guarantee .....
	Standard Guano & Chemical Co., New Orleans, La.	
997	ACID PHOSPHATE.....	S. J. Johnson, Ellisville.....
1053	" "	S. J. Taylor, Enterprise.....
1074	" "	The Eugene Simpson Co., Terry
		Guarantee.....
	BOOD, BONE, AND MEAT	
993	GUANO.....	S. J. Johnson, Ellisville.....
1108	" " "	Hyman Mer. Co., Summit.....
		Guarantee.....
	CHANPION FARMER'S	
1033	CHOICE.....	S. Wolf, Osyka.....
1076	" " "	E. M. Carter, Centreville.....
		Guarantee.....
1035	KAINIT.....	Wm. Atkinson-Bacot Co., Osyka
		Guarantee.....
1034	GROUND BONE.....	Wm. Atkinson-Bacot Co., Osyka
		Guarantee.....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Val. Per Ton.
		Water-Soluble.	Citrate-Soluble.	Insoluble.	Total.			
1073	16.83	13.79	2.23	.55	16.57	.....	.....	$14.19
....	.....	*13.00*	*2.00*	*2.00*	*17.00*	.....	.....	*13.30*
991	13.36	7.89	2.31	.88	11.08	2.19	1.42	16.86
992	12.41	8.12	2.47	1.47	12.06	2.08	1.85	17.39
1049	12.83	7.87	2.65	1.14	11.66	2.15	1.94	17.57
....	.....	*7.50*	*2.50*	*2.00*	*12.00*	*1.75*	*1.00*	*15.13*
1050	5.15	.....	.....	.....	.....	.....	12.54	12.54
....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1051	11.04	6.81	1.75	.19	8.75	1.92	2.19	15.37
....	.....	*7.00*	.....	.....	.....	*2.25*	*2.00*	*14.63*
997	13.09	10.57	5.88	.46	16.91	.....	.....	14.22
1053	12.09	10.91	4.58	.96	16.45	.....	.....	13.48
1074	13.88	10.40	5.65	.72	16.77	.....	.....	13.88
....	.....	*10.00*	*2.00*	*1.00*	*13.00*	.....	.....	*10.60*
993	12.06	8.10	2.53	1.59	12.22	2.20	2.64	18.52
1108	10.59	6.60	3.00	1.02	10.62	2.24	3.24	18.14
....	.....	*4.00*	*4.25*	.....	.....	*1.70*	*2.00*	*14.08*
1033	11.63	6.37	3.14	.74	10.25	2.29	1.46	16.39
1076	11.58	6.42	2.88	.63	9.93	2.24	1.84	16.45
....	.....	*4.00*	*4.00*	*1.00*	*9.00*	*1.65*	*1.50*	*13.20*
1035	4.38	.....	.....	.....	.....	.....	12.42	12.42
....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1034	5.36	.....	.....	.....	17.09	2.86	.....	15.70
....	.....	.....	.....	.....	*18.50*	*2.50*	.....	*15.50*

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
994	MISS. HOME GUANO....	HattiesburgComp. Co.,Hattiest
....		Guarantee.....
1052	STERN'S AMMONIATED R.	W. J. Davis, Terry.....
995	B. SUPERPHOSPHATE..	B. F. Fridge, Ellisville.....
996	" " "	Hyman Mercantile Co., Summi
1075	" " "	McLeod & Co., Purvis.....
	" " "	Guarantee.....
	Tennessee Chemical Company, Nashville, Tenn.	
	OX BRAND BONE WITH	
1084	AMMONIA AND POTASH	Myers & Egger, Columbus...
....		Guarantee .....
1110	OX BONE AND POTASH..	The W. B. Potts Co., Kosciusk
....		Guarantee .....
1085	OX COTTON GUANO....	Myers & Egger, Columbus...
1086	" " ..	Myers & Egger, Steenston...
....		Guarantee .....
1087	OX HIGH GRDE DIS. BONE	Myers & Egger, Columbus...
1088	" " " "	Myers & Egger, Steenston...
		Guarantee .....
	Threefoot Bros. & Co., Meridian, Miss.	
	THREEFOOT'S IMPROVED	
999	MIXTURE.....	Threefoot Bros. & Co., Meridia
....		Guarantoe.....

Laboratory Number	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value per Ton.
		Water-Soluble.	Citrate-Soluble.	Insoluble.	Total.			
994	12.17	8.15	2.74	1.56	12.45	2.14	2.72	$18.69
....	.....	*4.00*	*5.00*	.....	.....	*1.65*	*2.00*	*14.63*
1052	15.37	6.33	1.56	1.24	9.13	1.68	1.57	13.50
995	11.74	6.41	3.30	1.00	10.71	1.70	1.74	15.47
996	11,55	7.02	2.63	1.23	10.88	1.73	1.82	15.53
1075	19.02	6.18	2.48	.82	9.48	1.89	1.68	14.82
....	.....	*4.00*	*4.00*	*1.00*	*9.00*	*1.65*	*1.50*	*13.23*
1084	9.66	7.27	4.00	.82	12.09	.83	1.19	14.15
....	.....	*6.00*	*4.00*	*1.00*	*11.00*	*.85*	*1.00*	*12.73*
1110	11.14	9.81	4.32	.42	14.55	.....	1.26	14.96
....	.....	*7.00*	*5.00*	*1.00*	*13.00*	.....	*1.00*	*12.50*
1085	9.36	8.69	3.73	1.18	13.60	1.35	1.20	16.62
1086	9.93	8·60	3.62	1.36	13.58	1.29	1.18	16.26
....	.....	*6.00*	*4.00*	*1.00*	*11.00*	*1.65*	*1.00*	*14.73*
1087	10.37	11.55	3.22	.35	15.12	.....	.....	12.97
1088	12.78	12.58	2.49	.41	15.48	.....	.....	13.31
....	... ..	*8.00*	*6.00*	*1.00*	*15.00*	.....	.....	*12.00*
999	12.91	8.35	2.60	.84	11.79	1.74	2.36	17,40
....	.....	*8.00*	*2.00*	*1.00*	*10.00*	*1.75*	*2.00*	*16.18*

TABLE II.—Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1898-'99.

Name of Brand and Address of Manufacturer.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton
	Water Soluble.	Citrate Soluble	Insoluble.	Total.			
Armour Packing Co.,							
Kansas City, Mo.							
Fertilizer No. 271	5.00	2.00	1.50	8.50	1.50	1.00	$11.55
Fertilizer No. 386	5.00	3.00	3.00	11.00	2.50	6.00	19.95
Blood Bone and Potash	5.00	4.00	2.00	11.00	4.00	7.00	25.60
Fine Ground Beef Bone	.....	9.00	16.00	25.00	2.50	.....	14.32
Fertilizer No. 285	8.00	—	—avail	able—	1.65	5.00	16.33
Birmingham Fertilizer Co.,							
Birmingham, Ala.							
Birmingham High Grade Fertilizer	7.00	2.00	1.50	10.50	1.64	2.00	14.90
Boss Guano,	7.00	2.00	1.50	10.50	1.64	2.00	14.90
Cahaba Acid Phosphate	10.00	2.00	1.50	13.50	.....	.....	10.60
Prolific Acid Phosphate	11.00	2.00	1.50	14.50	.....	.....	11.50
Capital Fertilier Co.,							
Jackson, Miss.							
High Grade Acid Phosphate,	10.00	2.00	.50	12.50	.....	.....	10.60
Kainit	.....	.....	.....	.....	.....	12.00	12.00

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Mississippi Guano	7.00	2.00	1.50	10.50	1.50	2.00	14.55
Nonpareil	7.00	2.00	1.50	10.50	1.50	2.00	14.55
Our Vegetable Grower	6.00	2.00	1.00	9.00	2.25	3.50	16.93
Producer	7.00	2.00	1.50	10.50	1.50	2.00	14.55
Red Star Brand Guano	7.00	2.00	1.50	10.50	1.50	2.00	14.55
Capital City Oil Mill Mfg. Co.,							
Baton Rouge, La.							
Capital Fertilizer	6.50	1.50	1.00	9.00	2.00	1.70	14.55
Continental Fertilizer Co.,							
Nashville, Tenn,							
Sunny South Acid Phosphate	10.00	3.00	1.00	14.00	.....	.....	11.40
Eddystone Soluble Guano	7.00	2.00	1.00	10.00	1.65	1.00	13.93
The Goulding Fertilizer Co., Ltd.							
Pensacola, Fla.							
Goulding's High Grade Acid Phosphate	12.00	3.00	1.00	16.00	.....	.....	13.20
Goulding's High Grade Acid Phos. and Potash	11.00	3.00	1.00	15.00	.....	1.00	14.70
Goulding's Bone Compound	8.00	2.00	2.00	12.00	1.65	1.50	15.43
Jackson Fertilier Co.,							
Jackson, Miss.							
Acid Phosphate	10.00	2.00	2.00	14.00	.....	.....	10.60
Gulf States Guano	6.00	1.60	1.00	8.60	1.55	1.80	13.12
Kainit	.....	.....	.....	.....	.....	12.00	12.00
Royal C. Brand	6.00	1.60	1.00	8.60	1.55	1.80	13.12
Vegetable and Fruit	3.00	3.00	1.00	7.00	3.00	4.00	17.20
Lotterhos & Huber's Tomato Grower	6.00	4.00	1.00	11.00	2 40	1.00	16.60
Merbach & Eagan,							
Crystal Springs, Miss.							
Bat Guano	.....	.....	.....	5.00	4.25	.65	14.28

TABLE II.—Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1898-'99.

Name of Brand and Address of Manufacturer.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton
	Water Soluble.	Citrate Soluble	Insoluble.	Total.			
A. D. Adair & McCarty Bros., Atlanta, Ga.							
Buffalo Bone Fertilizer	6.00	3.00	2.00	11.00	1.75	2.00	15.08
Farish Furman Formula	6.00	4.00	2.00	12.00	.....	2.00	11.60
Furman's High Grade Dissolved Bone	8.00	4.00	2.00	14.00	.....	.....	10.40
Furman's Sol. Bone with Ammonia and Potash	6.00	4.00	2.00	12.00	.85	1.00	12.73
Meridian Fertilizer Factory, Meridian, Miss.							
Meridian Acid Phosphate	12.00	2.50	1.00	15.50	.....	.....	12.80
English Acid Phosphate	10,00	2.50	.50	13.00	.....	.....	11.00
Meridian Blood and Bone	7.75	2.00	2.50	12.25	1.65	1.85	15.53
Meridian Farmers' Friend	8.00	2.50	1.00	11.50	1.25	1.50	14.88
Meridian Home Mixture	7.75	2.00	1.00	10.75	1.75	1.85	15.78
Meridian Vegetable Grower	5.00	1.00	.50	6.50	2.50	6.00	18.15
Meridian Soluble Guano	7.75	2.00	1.00	10.75	1.75	1.85	15.78
Kainit	.....	.....	.....	.....	.....	12.00	12.00
Meridian Bone and Potash	10.00	2.00	.50	12.50	.....	3.00	14.80

Mobile Phosphate & Chemical Manufacturing Co., Mobile, Ala.							
English Acid Phosphate	12.00	2.00	1.00	15.00	.....	.....	12.40
I. X. L. Acid Phosphate	10.00	2.00	1.50	13.50	...	.....	10.60
Eclipse Soluble Guano	6.00	2.00	1.50	9.50	1.65	2.00	13.93
German Kainit	.....	.....	.....	.....	.....	12.00	12.00
K. K. K. Sol. Ammoniated Bone	8,75	1.25	1.50	11.50	.85	1.00	13.00
Mobile Standard Guano	6.00	2.00	1.50	9.50	1.65	2.00	13.93
New Orleans Acid & Fertilizer Co., New Orleans, La.							
Black Diamond Acid Phosphate	11.00	2.00	2.00	15.00	.....	.....	$11.50
Crescent City Acid Phosphate	11.00	2.00	2.00	15.00	.....	.....	11.50
Gold Dust	7.50	2.50	2.00	12.00	1.75	1.00	15.13
Goldsmith's Improved Mixture	7.50	2.50	2.00	12.00	1.75	1.00	15.13
Dissolved Bone	13.00	2.00	2.00	17.00	.....	.....	13.30
Vegetable Grower	6.00	1.25	2.00	9.25	2.80	2.60	16.73
Planters Fertilizer Mfg. Co., New Orleans, La.							
Cotton and Corn	7.00	.....	.....	.....	2.25	2.00	14.63
Southern Fertilizer Co., Atlanta, Ga.							
Scotts' High Grade Acid Phosphate	11.00	3.00	1.00	15.00	.....	.....	12.30
Scotts' Gossypium Phospho	6.00	3.50	1.00	10.50	2.05	2.00	16.28
Scotts' Potasso Phospho	10.00	3.00	1.00	14.00	.....	2.00	14.70
Standard Guano and Chemical Mfg. Co., New Orleans, La.							
Acid Phosphate	10.00	2.00	1.00	13.00	.....	.....	10,60
Blood Bone and Meat Guano	4.00	4.25	.....	.....	1.70	2.00	14.08
Champion Farmers' Choice	4.00	4.00	1.00	9.00	1.65	1.50	13.23

TABLE II.—Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1898-'99.

Name of Brand and Address of Manufacturer.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton
	Water Soluble.	Citrate Soluble	Insoluble.	Total.			
Ground Bone	.....	.....	.....	18.50	2.50	.....	15.50
I. C. Diamond Brand	4.00	4.00	1.00	9.00	1.65	1.50	13.23
Kainit	.....	.....	.....	.....	.....	12.00	12,60
Miss. Home Guano	4.00	5.00	.....	.....	1.65	2.00	14.62
Pelican Raw Bone Guano	4.00	4.00	1.00	9.00	1.65	1.50	13.23
Standard Ammoniated Sol. Guano	4.00	4.00	1.00	9.00	1.65	1.50	13.23
Threefoot's High grade English Acid Phosphate.	13.00	2.00	.....	.....	.....	.....	13.30
Stern's Am. R. B. Super Phosphate	4.00	4.00	1.00	9.00	1.65	1.50	13.23
Tennessee Chemical Co., Nashville, Tenn.							
Ox Bone and Potash	7.00	5.00	1.00	13.00	.....	1.00	12.50
Ox Bone with Ammonia and Potash	6.00	4.00	1.00	11.00	.85	1.00	12.73
Ox Cotton Guano	6.00	4.00	1.00	11.00	1.65	1.00	14.73
Ox High Grade Dissolved Bone	8.00	6.00	1.00	15.00	.....	.....	12.00
Threefoot Bros. & Co., Meridian, Miss.							
Threefoot's Improved Mixture	8.00	2.00	1.00	11.00	1.75	2.00	16.18

Analyses and Guarantees

—OF—

FERTILIZERS

—ON SALE—

IN MISSISSIPPI.

Third Monthly Edition, Season 1898-'99.

These bulletins will be sent free to any address upon application to State Chemist.

MISSISSIPPI AGRICULTURAL

EXPERIMENT STATION.

BULLETIN No. 56. APRIL, 1899.

GRAPES.

BY J. S. MOORE.

During the fall of 1888 a small vineyard was planted at this place, by the Station, to determine what varieties are best adapted to our soil and climate. A bulletin on this subject was issued in 1892, giving notes on the location, method of pruning, and a description of a few of the varieties, etc. At that time many of the varieties were only one year old, and others had produced but one crop of fruit. It was of course impossible to determine the value of such varieties at that age. This being the case we are not surprised that in many instances we have secured results differing very much from what was anticipated at the time the former bulletin was issued.

Location and Soil. The success or failure of the grape culturist often depends upon the climate and character of the soil. It should be remembered that no one grape is suited to all localities. A grape that will make an excellent yield of very choice fruit at one place may be a complete failure under different conditions. Therefore a new variety cannot be recommended for any district until it has had a thorough test in that locality. Every rich soil will not make a suitable site for a vineyard. Low bottom

land, however rich, should not be selected for such work. Our work at this Station, in testing the following varieties, has been done on a yellow loam upland, underlaid with a heavy red clay. It was used as a vegetable garden before the vineyard was planted.

Preparation of the land. The necessity of thoroughly preparing the land cannot be too strongly emphasized. This land is being prepared for a crop that is supposed to last for several years, and we will have no opportunity of breaking it again. Break as deeply as possible with a two-horse turning plow, following this with a subsoil plow. Then harrow until the land is smooth. The distance left between the vines in planting will, of course, depend upon the character of the soil and the variety of grape grown.

For medium growers we prefer 8x10 or 10x10 feet. We dig the hole about 18 inches square, and from 12 to 18 inches deep. As the plant requires considerable phosphoric acid, we place from 5 to 8 pounds of old bones in the bottom of each hole. We then throw in enough loose soil to cover them, that the tender roots may not come in direct contact with their hard surface. These bones may usually be procured at small cost from slaughter houses or in old fields. This, with from 3 to 4 pounds of wood ashes to furnish potash, applied once a year, is all the fertilizer that we have used.

Planting. Authorities differ as to whether it is better to plant in the fall or in the spring. Our experiments indicate that there is little difference between the two seasons for planting at this place. In purchasing, the buyer should be sure that he is getting vines from a reliable nurseryman. One year old vines are preferable. At planting, the entire top of the vine, excepting the two buds just above the original cutting, should be removed and all of the broken or bruised parts of the roots should be trimmed away. The vine is now ready for planting and upon the correctness of this much depends, for a good growth cannot be secured from a poorly planted vine. The soil

in the center of the hole should be slightly raised and the roots should be placed as near in their natural position as possible. The loose soil that came from the top of the hole in digging should be well pulverized and placed around the roots with the hand and should then be firmly packed by tramping with the feet. There being but few roots in the upper part of the hole, the subsoil, or the soil last taken out in digging, is now thrown in, slightly packed, and upon this is thrown a little loose surface soil, covering the plant just a little deeper than it was originally.

Treatment for the First Year. After the buds start in the spring and it becomes evident which of the two has made the stronger growth, the weaker one should be removed. The laterals of the remaining one should be broken off as fast as they appear, that all the nourishment may be thrown into the main stem. The land may be sown for the first two years in cowpeas, and the peas may be picked to cover the cost of cultivation, but the vines should be plowed under in the fall. Cultivate early in the spring with a one-horse turning plow; at first throwing the dirt from the vines and at the second plowing throwing it to them. After this use a five-tooth cultivator as often as necessary to keep the crop clean and the land in good condition. No plowing should be done after the fruit is full grown, but a hoe may be used when necessary to kill the weeds and grass.

Trellises. There are several different styles of trellises now in use. The fact that all of these are used by successful viticulturists makes it apparent that no one kind combines all of the good points, but that the value of each depends partly upon the variety of grape grown, and partly upon the method followed in pruning the vine.

Vertical Trellis. If the vines are eight feet apart in the row the posts should be sixteen feet apart, and if the vines are ten feet the distance between the posts should be twenty feet. The posts should stand five feet above ground and the end posts well braced. Three No. 12 galvanized

iron wires are then stretched and fastened to the posts at twenty, forty, and fifty-eight inches from the ground.

Horizontal Trellis. In this trellis a piece 2x4 is nailed to the top of the posts at right angles to the row. Three wires are stretched and fastened to these cross-pieces, the two outside wires being fastened near the ends of the 2x4 pieces, while the center wire comes directly over the posts. We prefer the horizontal trellis because the pruning can be done more easily, and the leaves being nearly all above the wires furnish a partial protection for the fruit against the attack of fungus diseases and shades it from the sun, which often causes serious injury during the hottest portions of the day. Further protection from the sun is secured by having the trellis run north and south.

Pruning and Training. The object of pruning is to keep the vine and fruit under control. Pruning enables us to secure the largest and the best quality of fruit the vine is capable of producing without injury to itself. The fruit is borne near the base of the newly formed shoots. These shoots are always to be found on wood of last year's growth.

The current year's growth is called a shoot; the growth of the preceding year, or a ripened shoot, a cane; and the part that is two years old or more is called an arm. If the object and the basis upon which the principles of pruning rest are kept in view, pruning is a comparatively simple and easy operation. It is impossible to give any rigid and unchangeable rules for pruning. The habits of each variety, the character of the soil, and the location go far towards determining just how it should be done. Some varieties; such as, the Herbemont, Champion, and Concord, which are very rank growers, should not be pruned as closely as some of the weaker varieties; such as, the Delaware and the Wyoming.

The pruning may be done at any time between the first of December and the first of March, but it should always be completed before the sap begins to flow in the spring.

If the vertical trellis is adopted, we follow the "renewal system;" that is, all of the old wood is cut back to near the head of the vine and the trellis is covered with a new growth each year. If there are three strong vigorous canes from near the ground, we cut all of the old wood away, leaving the young canes for the season's growth. If there are not three young canes, then leave the old one that is in the best condition, cutting it off just above the first strong shoot. The arms that are left should be cut off at or just below the top wire and from three to five canes with from four to six buds, are left on each. As soon as the pruning is completed, the vines should be tied to the wires. One should be fastened vertically, while the others should be inclined at an angle of about forty-five degrees on each side, that the young shoots from the vine may have the greatest possible room.

With the horizontal trellis another method is used. After all the shoots, excepting the strongest one, are broken off, a stake long enough to reach the top of the trellis should be driven down by the side of the young vine. This stake need not be large as it is only a temporary support until the vine can reach the trellis. The vines should be gone over every few weeks and tied to the stakes to prevent them from falling over and growing out of shape. Each time, in going over, the laterals should be broken off so that the nourishment may be thrown into the main stem, which should make a growth of from three to seven feet in one year. As soon as the vine has reached the wire it should be pinched back, allowing the two buds, immediately below the point pinched, to send out laterals, one in each direction along the mid wire. When these shoots are about four feet long their ends should also be pinched off and the nourishment for the rest of the year should go towards the growth of laterals from these two branches. The following winter we leave from three to six canes, containing from four to eight buds, on each arm of the vine. All others are cut off close to the main arm.

The summer pruning is practically the same for both

styles of trellis. The time to do this pruning is when the young shoots are about six inches long and when the bunches of grape can be distinctly seen. Pinch off the vine with the thumb and finger about two or three leaves beyond the last bunch of grapes, allowing from two to three bunches to the shoot. The laterals from these shoots should be broken off every two weeks until the fruit is about grown. The next winter's pruning will be similar to the last. Cut off all the young canes that bore fruit the last year close to the arm, leaving from four to six of those that were barren last year, with from three to six joints each for the canes of next year.

When the horizontal trellis is used it often becomes necessary to replace the old stem that runs from the ground to the wire with a new vine. By a little care and judgment this is very easily accomplished. When such a vine is needed, instead of rubbing off all the buds and young shoots in the spring of the year, we leave the strongest shoot that we can find near the base of the old vine to take the latter's place the following year. This should be tied to the old vine in the same way that the young vine was tied to the stake, and should be treated as recommended for vines of one year's growth. The old vine is cut away at the next winter's pruning; or, if the young vine has not made a rapid growth, the old one may remain until the following season. It is very necessary that all of the sprouts and young shoots be kept rubbed off from around the roots and along the stem.

Sacking. Our experiments show that sacking pays well with most varieties. It is a simple, cheap, and practical way of securing choice fruit. Two to four pound paper sacks should be used, which will cost from $1.00 to $1.50 per thousand. For fastening these the cheapest quality of pins will answer. The sacks should be put on when the grapes are about the size of small bird shot. It is very necessary that the grapes be covered when small if we expect to keep them free from fungus diseases, which are becoming more and more common in nearly all

vineyards. The bag should be slipped over the bunch with the stem in the center and the mouth completely closed before pinning. If this precaution is not taken very little good will result from sacking. We have found here that grapes will ripen much more evenly when sacked; that they will remain on the vines from two to three weeks longer; that some of the varieties disposed to rot very badly when unsacked remain perfectly sound when thus covered; and that fruit when thus sacked is protected from birds and insects which are very bad here.

Diseases of the Grape. Nearly all of the more common diseases of the grape; such as leaf blight, downy mildew, powdery mildew, anthracnose, black rot, and biter rot, have been observed in this State. The bitter rot, however, is the only one that has caused much serious injury to this crop. It does not appear until the fruit begins to ripen, but spreads rapidly, causing the berries to drop from the stem and rendering them unfit for market. The late ripening varieties are much more liable to be injured by this disease than those that ripen early.

Remedies. We have found the Bordeaux mixture a very effective remedy for all diseases found here, excepting the bitter rot (*Melanconium fuiginium*). A satisfactory remedy for this disease has not yet been tried at this Station. If we have a wet season at the time that the grapes are ripening the fruit is sure to be very much injured. The Bordeaux mixture should be made as follows:

Copper sulphate,..... 6 pounds.
Fresh or unslacked lime,..... 4 pounds.
Water.....50 gallons.

Tie the copper sulphate in a course sack and dissolve by putting in a wooden vessel containing about six or eight gallons of water. The sack should be suspended just below the surface of the water by means of a string. The lime should be thoroughly slacked by adding a small quantity of water at a time, then add enough to make a thick whitewash. After this has been done strain the whitewash into the copper sulphate solution, stirring the latter

briskly at the same time. Pour into a barrel that will hold about fifty gallons and fill with water. It is then ready for use, but should be thoroughly stirred before each application.

The first spraying should be made just after the buds begin to swell, another, when the leaves are about half grown, and a third, when the plants are in full bloom. After this, an application should be made every ten days or two weeks until the fruit begins to ripen. If possible, the spraying should be done at a time when the indications are favorable for two or three days of dry weather, as a rain immediately after the application will wash the greater portion off.

The knapsack sprayer, in some of its forms, is large enough to do the spraying in most vineyards in this state, and is probably the most effective that can be found. These may be had from some of the various firms who are engaged in the manufacture and sale of such machines.

Varieties of Grapes. Below we give a description of some of the varieties of grapes which have been grown for several years at this Station.

Admirable. Vine a weak grower; bunches medium large to large, from loose and irregular to compact; berries large, amber colored; skin and pulp rather tough: tolerably free from rot. This is one of the late varieties. Yield fair.

Agawam. Vine not very healthy; one of three that were set out six years ago, is about dead. The others are in fairly good condition; bunches small to large, loosely clustered, often quite ragged. Some seasons, however, the bunches are large and well filled; berries large red, at times almost black. It has a peculiar sprightly foxy flavor which is liked by most people. A little earlier than the Delaware. Yield good.

America. A vigorous vine and one that makes a rapid growth; bunches medium size, compact, not shouldered; berries medium black; skin tough; pulp tender. The flavor

resembles that of the wild grape. They are not good unless allowed to stay on the vine for some time after they are apparently ripe. A very good late maturing variety. Yield large.

Atavite. A weak growing variety; bunches are small, irregular, and shouldered; berries from small to medium, black. A very early variety. Flavor good. Yield small.

Bacchus. A very vigorous grower for the first three years, it then became diseased and is now practically dead; bunches medium size, berries rather small, black. Very little rot. Yield fair.

Beagle. Not a very rank grower; bunches variable in size, sometimes being small and at others large, long, and compact; berries medium size, black, 1 to 2 seeded. Taste similar to the Concord, but about two weeks earlier. Fruit shatters off very badly when overripe. Subject to rot. Quality of fruit fair. Yield good.

Bell. Bunches medium size, fairly compact; berries medium size, white, with a pleasant flavor; skin and pulp tender. Fair crop. Very little rot.

Berchmans:—A weak vine, never seemed to be healthy; bunches and berries small, resembles the Delaware very much, but ripens about one week later. Some rot. Good yield.

Beta. Vine moderately vigorous; clusters large, compact, not shouldered; berries very large, deep red, poor quality, but a heavy bearer.

Big Black. A moderately vigorous well fruited vine; bunches large, loose or comapct, and shouldered; berries very large, black, Concord style, but ripening about ten days later; skin and pulp a little tough. Very little rot has been noticed in this variety. Shipping qualities good. Flavor poor. Yield fair.

Big Extra. Vine very unhealthy and a poor producer of fruit; clusters medium large and compact, Yield very light.

Big Red. A very vigorous grower; bunches large, well filled, and shouldered; berries medium bright red; skin tender; pulp rather tough; a pleasant flavor. Large yield. Very little rot.

Black Herbemont. Vine in good healthy condition; bunches medium small; berries very small and black. Yield light.

Black July. A very vigorous grower and fairly prolific; bunches from small to medium large, compact, well filled, and shouldered; berries small black; very little rot. Yield good.

Blanco. Vine very vigorous; bunches small to medium size; berries medium white, sweet, insipid flavor. No rot. Yield fair.

Blood. Vine has made a very small growth; a rather weak variety and only a moderate bearer; bunches small to medium, compact; berries very small black, and rather sour unless allowed to thoroughly ripen which takes some time after berries are black. Ripens about one week later than the Concord. A very little rot. Yield fair.

Brighton. A vigorous grower and a heavy bearer for the first three years, but the last two seasons the vines have been unhealthy. This resembles the Concord, but, is far superior in the size and shape of the bunches and berries; these qualities and the excellent flavor of the Brighton make it one of the best tested by us. Bunches large, shouldered, from loose to quite compact; berries medium large, wine color; suffers considerably from rot unless sacked. Yield not very large.

Brilliant. Although this grape gave promise during the first three years of being a very hardy and thrifty grower here, we are not able to class it among our most prolific varieties. Bunches vary in size from medium small to large, compact, shouldered; berries large bright red, with an excellent flavor; very little rot. Ripens about the same time as the Delaware, which variety it resembles very much. Yield good.

Carman. Vine very strong, vigorous, and prolific; bunches large to very large, compact, and shouldered; berries medium size, dark red, almost black, round, some times wilt badly on the vine; skin very thick, rather tough; pulp fleshy, mostly three-seeded, seed large. Ripens late, about the same time as the Jefferson. Yield large.

Carminet. Bunches small and ragged; berries small black, and sweet; skin and pulp tender. Rots badly unless sacked, when sacked fairly good sound grapes are secured. Good crop for some years, though the yield is uncertain.

Champion. Vine a rank vigorous grower and very prolific. This is one of the earliest varieties that we have grown, and so far has given the largest yield of any. As a shipping grape, we believe that there are few that will equal it, though after the better flavored varieties are put on the market it will stand a poor show. Bunches are large and well filled, berries large black. Yield large, in 1893 averaging on eight vives 32 pounds each.

Concord. This is probably the best known grape that is on the market today. The vine is vigorous, healthy, and prolific; bunches large, well filled; berries large black; skin thin; pulp fleshy. Flavor fair. Yield good. Ripens about the middle of July.

Cottage. This resembles the Concord very closely; clusters and berries a little larger; quality better. About two weeks earlier than that variety.

Cunningham. A very rank growing variety and one that is in a good healthy condition; bunches medium to large, compact, and shouldered; berries small to medium, black; skin and pulp tender. Very little rot, but the berries wilt badly when exposed to the direct rays of the sun. Yield good.

Damascus. Vine not very healthy; bunches large, long, well filled; berries very large, oblong, dark red; skin tender; pulp large and fleshy; flavor good. Most of the fruit rots before ripening unless sacked and even then the crop is uncertain.

Delaware. Not a very rank grower, but the vine does well here and remains in good healthy condition. Bunches vary in size from small to medium, compact; berries below medium in size, light red; skin thin; pulp tender; flavor equal to the best. This is, no doubt, one of the best grapes for general purpose that we have. It ripens evenly; the bunches, while not large, are showy; the yield is usually much above the average, and the fruit will remain on the vine for some time after it is ripe.

Diamond. This is sometimes known as Moore's Diamond. Vine makes a medium growth and is fairly prolific. Bunches are small to large compact, and shouldered, berries medium size; color greenish white; skin and pulp tender; good flavor. During a wet season at the time of ripening there is considerable rot.

Diana. Vine fairly vigorous and healthy; bunches small, but very compact; berries medium red; sweet pleasant flavor; skin and pulp tough. Some rot. Yield fair.

Denison. Vine a very weak grower, but a moderate bearer; bunches small and loose; berries large black, with the Concord flavor. Ripens about one week earlier than the latter.

Dinkel. Vine fairly vigorous; bunches medium to large shouldered; berries large dark red; skin and pulp tender. Berries rot very badly when not sacked. In 1896 about 95 per cent of those not sacked rotted, owing to rain at time of ripening, while those protected by the sacks were almost free from rot. The quality of the fruit of this variety is good.

Dr. Kemp. Vine a vigorous grower and very prolific; bunches large, long, and loose or small, compact, and shouldered; berries medium dark red, sprightly acid flavor; skin and pulp tender. Very little rot.

Duchess. Vine rather small and a weak grower; bunches medium to large, compact and shouldered; berries medium, round, and greenish white; sweet pleasant

flavor; skin not very thick, usually covered with small black spots. Yields well and would be an excellent white variety, but for the fact that it rots very badly, especially if we have rainy weather at the time of ripening.

Early Market. A good healthy and vigorous vine; bunches small and compact; berries small to medium black. Yield only fair.

Early Victor. Only a moderate grower. Fairly prolific; clusters medium compact; berries small black. Quality not very good.

Eaton. A fair growth of vine, healthy. Bunches small to large, generally compact, but sometimes ragged; berries large, black. Resembles the Concord. Ripens very unevenly like the Worden. Sprightly acid flavor. Quality fair.

Ebony. Vine vigorous. Bunches small and loose; berries small black. The crop is usually very small from this variety, but is not bad about rotting.

Elvicand. A healthy vigorous vine and fairly productive. Bunches small and loose; berries medium, oval, almost black. Yield not large.

Empire State. Vine fairly vigorous and healthy; bunches medium size, tolerably compact, shouldered; berries medium white; sweet pleasant flavor; skin and pulp tender; quality fair. Yield small.

Excelsior. Vine weak and unhealthy; bunches large; berries medium size, light purple; skin tender; pulp fleshy; excellent flavor. Rots badly. Yield poor.

Francis B. Hayes. Vine a weak grower; bunches medium, fairly compact; berries medium white, round; skin tender; pulp rather tough, sweetish insipid flavor. Vine is not vigorous enough nor is the yield large enough to make this a popular grape for this place.

Golden Gem. Vine small and weak; bunches small and compact; berries small to medium white; flavor excellent. Most of the fruit rots before ripening. Yield poor.

Goethe. Vine a weak grower; bunches small to medium, loosely clustered, berries medium to large, oblong, wine color; skin and pulp tender; flavor excellent; good quality; full crop. Rots badly.

Gold Coin. Vine vigorous; bunches small to medium compact; berries large white; pleasant flavor. A good yield.

Gov. Ross. A moderate grower and tolerably prolific; bunches medium size, loose; berries medium white; skin and pulp tender; pulp fleshy. A poor variety as it rots very badly.

Green Mountain. This has proven to be a very nice grape for home use; the skin is too thin and tender to allow it to be classed among the profitable shipping varieties. The vine is a vigorous medium ripening variety; bunches medium to large and loose; berries small greenish white; pulp tender and sweet; yield good.

Herbemont. Vine not very vigorous, but prolific; bunches medium and compact; berries small and black. One of the very late ripening varieties. Quality poor. Yield fair.

Hermann. A very good small black grape. It ripens from the latter part of July to the first of August; bunches small and compact. Quality good. Yield fair.

Hermann Jaeger. A very good variety for this locality. The vine is vigorous and prolific; bunches large, very compact; berries large, light purple. Yield large.

Hilgard. Vigorous growth, but yield poor; bunches large and loose, berries large, dark red, almost black; skin tough. Ripens about ten days or two weeks later than the Champion. Yield is rather small and the quality is poor.

Highland. Resembles the Concord and Eaton, about ten days later; bunches more compact; berries slightly larger than the Concord, more subject to rot. Yield about the same. Ripens evenly.

Iona. A weak grower. Clusters large and loose; berries medium, light red. Quality of grape poor. Ripens unevenly. Yield light.

Ives. This is, next to the Champion, the most prolific early grape that we have grown. Its quality is about the same as the Champion—poor. Ripens about one week later than the above.

Jacques. It has made a very vigorous growth and is quite prolific; bunches large, compact, and shouldered; berries small black. Eating qualities poor. Very much like the Herbemont and ripens about the same time. Yield fair to good.

Jaeger. A very vigorous vine, bunches loosely clustered; berries small black. Ripens late. Poor quality. Yield light.

Jefferson. An excellent medium maturing variety. Vines are healthy and prolific; clusters are large, loose, and shouldered; berries light red, with purplish bloom. Very little rot.

Lady Washington. The vines seemed healthy for the first three years after planting and were fairly prolific, but then became diseased and during the past year the yield has been small. Bunches small to large and loose; berries small greenish white; skin and pulp rather tough. Too unhealthy for this place.

Laussel. A medium size vine and one that is moderately prolific; bunches small, regular, and compact; berries small black; skin rather tough; pulp tender, mostly 4-seeded. Seed very large.

Letorey. Very vigorous and heavily fruited; bunches large and well filled; berries small black; skin and pulp tender.

Lindley. A moderate grower, seems well adapted to our soils, gives a good yield of medium large compact regular bunches, with large sweet flavored berries. Ripens about the same time as the Concord.

Martha. Vine vigorous; bunches medium to large compact; berries medium, greenish white; skin tender,

splits open very badly during wet weather. Flavor fair. Yield good.

Mills. Fairly vigorous, but not prolific, bunches large and loose; berries large, black, round; skin and pulp rather tough; pulp large and fleshy, mostly 1-seeded, good acid flavor. Shipping qualities good. Very little rot.

Missouri Reisling. Resembles the Delaware in size, shape, and color of berries. Bunches not so compact. Yield smaller. More subject to rot. Ripens about the same time as the Delaware.

Monitor. A moderate grower, but poor bearer; bunches small and loose; berries medium black. Poor in quality.

Moore's Early. Ripens about one week later than Champion. Resembles the Concord in quality; berries medium size, loose to tolerably compact; berries large black. Yield light.

Moyer. One of the best flavored, early ripening sorts, but the yield is small and the vine makes a weak growth.

Muench. One of the best of the latter ripening varieties. A very vigorous grower and quite prolific. Large, compact, and showy bunches; berries medium black, round, skin and pulp tough; pulp fleshy, pleasant flavor. Not troubled with rot.

Nectar. Vine a poor grower, fairly prolific; bunches medium size; berries light purple, medium size. Flavor fair. Yield light

Niagara. Vine made a vigorous growth for the first three years, but has since become diseased and has had a very poor crop of fruit for the last two years. The bunches are large and showy; berries white, about the size of the Concord. Ripens about one week earlier than that variety.

Norton. A well known variety. Vine vigorous and healthy, with a fair yield of fruit; bunches medium small, compact; berries small black; free from rot.

Onderdonk. One of the best white varieties grown by us. The yield is large; bunches medium to large, shouldered, compact. Very little rot.

Parry. Vine vigorous; strong, and healthy; bunches large, slender, and compact; berries small black; quality fair. Yield good.

Perkins. Resembles the Lindley. Vine is larger and more vigorous, with a larger yield.

Peter Wylie. Vine weak and yield poor; bunches medium size, compact; berries medium white; skin and pulp tender; rots badly.

Porup. A late ripening variety; berries fall from stem very badly; yield and quality of fruit poor.

Poughkeepsie. A vigorous vine with well filled large bunches; berries small red. Light crop of a poor quality of fruit.

Prof. Brunk. This variety ripens unevenly. The vine is vigorous and healthy; bunches medium size, ragged. A very late ripening variety, which is about the only recommendation that we could give it from the test that we have made here.

Prof. Gulley. The vine and fruit resemble the Concord. Fruit ripens irregularly about the same time as the above variety. Yield is not so large; more subject to rot.

Ragan. Vine vigorous and fairly prolific; bunches large, long, and well filled; berries medium black; skin and pulp tender; pulp large and fleshy pleasant flavor.

Rommel. A very large white variety. One of the best for table use. Ripens about the same time as the Delaware. Bunches large, compact, and shouldered; berries large greenish white. Yield good.

Rusty Coat. A healthy vine; bunches long, loose, and irregular; berries medium black; flavor good; yield fair.

Texas. A strong grower and a heavy bearer; bunches small and very compact; berries small black. Not a desirable eating grape, but is a very juicy wine variety.

Triumph. At first, thought to be one of our best varieties, but the vine has proven to be too weak and the fruit

too liable to rot for it to be classed among the promising sorts. The quality of the berries is also poor.

Ulster. An excellent flavored red grape, ripenes about the same time as the Concord; bunches small to medium. Yield good.

Walter. Resembles the Delaware very closely and ripens about the same time. Bunches and berries are slightly larger. The flavor is equalled by few that have been tested here. Yield fair.

Woodruff. A weak grower, but quite prolific; branches medium, compact; berries small, greenish white. Rots very badly unless protected by the sacks. Flavor poor.

Worden. Ripens about one week earlier than the Concord, to which variety it is very closely related. The bunches are larger and better filled; the berries are also larger. Ripens very unevenly. Quality fair.

Wyoming. Ripens about the same time as the Delaware; vine a moderate grower; clusters medium size, shouldered; berries medium red; skin tender; pulp tough. Yield is usually light.

Some of the following varieteties are young vines that have received only a partial test. Others have been grown for several years and with us have proved a failure.

BAILEY. A small yield of poor fruit.

BEACON. A young vine with only a few bunches of fruit.

BELVIN. Vine only one year old, very vigorous. No fruit this year.

BERTHA. Young vine, no fruit,

BLACK HAMBURG. Vine planted in 1892. Soon became diseased and died.

BLUE MUSCAT. Soon showed that it was worthless and was grubbed out.

BUMPER. A young vine, rather small. Well loaded with fruit; bunches large compact, and shouldered; berries small.

G. W. CAMPBELL. Vines were planted in 1992, did

well for first two years and then all the vines died; bunches large, compact, and shouldered; berries small white, with pleasant flavor; skin and pulp tender.

COLERAIN. One year old vine, not enough fruit to test.
COLUMBIAN IMPERIAL. Young vine, with only a few small tolerably compact bunches.

CHAMBLISS. Vigorous vine· bunches medium size.

CONELVA. Vine small and weak. Yield very light; bunches small and tolerably well filled; berries small black.

COTTAGE. Resembles the Concord. The yield for some seasons is good, for others almost a complete failure.

CURTIS. Only a moderate grower and not very prolific. Bunches are large, compact. and shouldered; berries small black.

DOWNING. This variety has only fruit for two years, and most of it has rotted both seasons.

EARLY OHIO. Young vine with a good crop of fruit. Bunches small. Ripens among the very earliest varieties.

EBONY. Young vine with very little fruit.

ELSMER. Vine small and weak. Fruit poor in quality and yield.

EXCELSIOR. Vines gave a poor yield of light purple berries for the first two years. Soon became diseased and died.

EUMEDEL. Vine young and small with a few small loose bunches.
FERN MUNSON. A weak grower, with a small yield of fruit that seems especially liable to rot.

FOUNTAIN BLUE. Fruit all rots.

GOLDEN CHAMPION. A worthless varity that was grubbed out at the end of the third year.

GREAT CLUSTER. A young vine and a weak grower. No fruit this year.

GRAYSON. A vine that has proven a complete failure here.

LONG JOHN. Only one year old. A good crop of perfect fruit. Bunches medium size, compact.

LAZELLE. A weak vine with a small amount of fruit.

NEWMAN. Vines medium growers. Only one year old with a small yield of fruit Bunches well filled, shouldered.

NORFOLK. Vine small and weak. Light yield of fruit.

NIMALBA. Has never borne enough fruit to judge of its quality.

OPAL. Vine is poor with a small yield of fruit.

PEARL OF ANVERS. A Small yield of fruit which usually rots before ripening.

PRES. LYON. Vine fairly vigorous, but with very little fruit.

PROGRESS. A vigorous vine but a poor bearer.

RED BUD. A healthy vine; bunches long; berries very scattering, small black; quality very poor.

RED EAGLE. A poor yield of small ragged bunches; berries red.

ROANOKE RED. Vine young and vigorous; bunches small and well filled. Yield only fair.

RUBY. A moderate grower, bunches small, berries small red.

SAVIGNON JAUNE. A very poor variety. Vine weak. Yield light.

VERDILBO. Vine weak. Yield light. Berries rot badly.

VAN DEMAN. Vine weak, bunches very irregular in shape, berries scattered, medium black.

ZINFANDEL. Yield is light and the fruit is too much subject to rot for it to be of value.

SUMMARY.

1. Select a warm, pourous, well drained soil with a southern or western exposure as a suitable location for the vineyard.

2. Great caution should be exercised in selecting the varieties of grapes and careful attention should be paid to the proper preparation of the land and the planting of the vines.

3. During the first year the extra shoots should be kept broken off and the vine properly trained.

4. We have found the horizontal trellis more desirable than the vertical.

5. Winter pruning should always be completed before the sap begins to flow in the spring.

6. Summer prunning should begin when the shoots are about six inches long and the bunches of grapes can be seen. After this the vineyard should be gone over every two weeks and all the laterals from these shoots pinched back until the grapes are about grown.

7. We have found that it pays to sack the grapes in this locality.

8. There are but few diseases of thd grape that are serious in this State. The Bordeaux mixture has proven an effective remedy for all, excepting the bitter rot (Melanconium fuliginium). As yet we have not found a sure remedy for this disease.

9. After a test of varieties extending over a period of several years we would recomend the following for cultivation in this State, giving them in the order of their maturity.

SHIPPING LIST.	TABLE OR LOCAL MARKET.
Champion,	Perkins,
Ives,	Niagara,
Perkins,	Delaware.
Niagara,	Agawam,
Delaware,	Brighton,
Lindley,	Lindley,
Concord,	Concord,
Hilgard,	Hilgard,
Moench.	Moench.

MISSISSIPPI AGRICULTURAL

EXPERIMENT STATION.

BULLETIN No. 57. APRIL 15, 1899.

Analyses of Commercial Fertilizers.

B. W. KILGORE, STATE CHEMIST.

The following analyses of fertilizers on sale in the State have been made since the third edition of the fertilizer bulletin was issued on March 15, 1899. Another edition will be published some time during the summer, to include all analyses made during the season.

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	Armour Packing Company, Kansas City, Mo.	
1150	FERTILIZER NO. 271.....	Bourland & Atkins, Amory.... Guarantee .....
1151	FERTILIZER NO. 272.....	Bourland & Atkins, Amory.... Guarantee .....
	Birmingham Fertilizer Company. Birmingham, Ala.	
1117	CAHABA ACID PHOSP'ATE	Meyers & Egger, Steenston... Guarantee .....
1118	PROLIFIC ACID PHOS'TE.	Hand Bros., Quitman..... Guarantee .....
1128	BIRMINGHAM HIGH GRDE FERTILIZER.....	Gilmore & May, Amory..... Guarantee .....
	Capital Fertilizer Company, Jackson, Miss.	
1154	RED STAR.....	S. Alcus, Summit..... Guarantee .....
	Capital City Oil Manufg. Co., Baton Rouge, La.	
1155	CAPITAL FERTILIZER....	R. E. L. Coon & Co., Woodville. Guarantee .....
	Jackson Fertilizer Company, Jackson, Miss.	
1157	LOTTERHOS & HUBER'S TOMATO GROWER.....	Lotterhos & Huber, Crystal Sp's Guarantee .....
1156	ROYAL C.....	G. T. Ragsdale, Hazlehurst....
1130	"	Abney & Travis, Heidelberg... Guarantee .....
	Meridian Fertilizer Factory, Meridian, Miss.	
1131	ENGLISH ACID PHOS'ATE	Turner Bros., Vossburg..... Guarantee .....

Laboratory Number	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value per Ton.
		Water-Soluble.	Citrate-Soluble.	Insoluble.	Total.			
1150	3.89	3.59	5.97	1.02	10.58	1.92	1.38	$15.14
....	.....	*5.00*	*2.00*	*1.50*	*8.50*	*1.50*	*1.00*	*11.55*
1151	7.19	3.77	4.88	.87	9·52	1.87	1.93	14.77
....	.....	*5.00*	*2.00*	*1.50*	*8.50*	*1.50*	*2.00*	*12.55*
1117	9.57	9.07	3.49	2.52	15.08	.....	.....	10.95
....	.....	*10.00*	*2.00*	*1.50*	*13.50*	.....	.....	*10.60*
1118	11.72	11.59	2.52	.69	14.80	.....	.....	12.45
....	.....	*11.00*	*2.00*	*1.50*	*14.50*	.....	.....	*11.50*
1128	12.06	7.97	2.53	2.30	12.80	1.82	2.40	17.20
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.64*	*2.00*	*14.90*
1154	10.44	7.02	3.71	.50	11.23	1.40	2.78	16.64
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.50*	*2.00*	*14.55*
1155	10.36	6.45	3.99	.65	11.09	2.88	1.83	19.07
....	.....	*6.50*	*1.50*	*1.00*	*9.00*	*2.00*	*1.70*	*14.55*
1157	13.82	8.32	2.43	2.06	12.81	2.56	2.79	19.70
....	.....	*6.00*	*4.00*	*1.00*	*11.00*	*2.40*	*1.00*	*16 60*
1156	15.80	7.62	2.55	1.24	11.41	1.80	2.03	16.45
1130	19.01	7.41	2.50	1.79	11.70	1.58	1.83	15.44
....	.....	*6.00*	*1.60*	*1.00*	*8.60*	*1.55*	*1.80*	*13.12*
1131	13.12	11.51	5.37	2.43	19.31	.....	.....	14.65
....	.....	*10.00*	*2.50*	*.50*	*13.00*	.....	.....	*11.00*

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	MERIDIAN FARMER'S	
1115	FRIEND.....	A. E. Dalrymple, Amory.....
		Guarantee.....
1158	MERIDIAN SOL'E GUANO	T. C. Simmons, Magnolia.....
		Guarantee.....
	MERIDIAN VEGETABLE	
1119	GROWER.....	J. L. Miller, Gallman.....
		Guarantee.....
	Mobile Phosphate & Chemical Co., Mobile, Ala.	
1120	ECLIPSE SOL. GUANO...	R. W. Fagan & Co., Waynesboro
		Guarantee.....
1132	KAINIT.....	E. F. Nunn & Co., Shuqualak..
		Guarantee.....
1129	MOBILE STANDARD.....	Gilmore & May, Amory.....
		Guarantee.....
	New Orleans Acid and Fertilizer Co., New Orleans, La.	
1121	BLK. DIAMOND ACID PH.	R. W. Carter, Iuka.....
		Guarantee.....
1133	BLOOD, BONE, & POTASH	W. W. Pigford, Lumberton....
1152	" " " "	Bourland & Atkins, Amory....
		Guarantee.....
1161	DISSOLVED BONE.....	Louis Bendat, McComb City...
		Guarantee.....
	CRESCENT CITY ACID	
1134	PHOSPHATE.....	W. I. Heidelberg, Heidelberg..
		Guarantee.....
1122	GOLD DUST.....	R. W. Carter, Iuka.....
1135	"	N. P. Welborn & Co., Laurel...
		Guarantee.....
1136	GOLDSMITH'S IMP. MIXT.	W. I. Heidelberg, Heidelberg..
		Guarantee.....
	Planters' Fertilizer Company, New Orleans, La.	
1137	COTTON AND CORN.....	Pittman, Rawls & Co., Columbia
		Guarantee.....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Val. Per Ton.
		Water-Soluble.	Citrate-Soluble.	Insoluble.	Total.			
1115	11.28	7.79	3.33	.88	12.00	1.94	1.99	$17.63
....	.....	*8.00*	*2.50*	*1.00*	*11.50*	*1.25*	*1.50*	*14.88*
1158	9.36	6.46	2.87	2.23	11.56	2.40	2.18	17.22
....	.....	*7.75*	*2.00*	*1.00*	*10.75*	*1.75*	*1.85*	*15.78*
1119	10.32	6.49	2.26	.45	9.20	2.65	5.30	20.45
....	.....	*5.00*	*1.00*	*.50*	*6.50*	*2.50*	*6.00*	*18.15*
1120	11.12	6.10	3.24	2.62	11.96	1.95	1.95	15.84
....	.....	*6.00*	*2.00*	*1.50*	*9.50*	*1.65*	*2.00*	*13.93*
1132	4.00	.....	.....	.....	.....	.....	12.60	12.60
....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1129	10.47	5.01	3.87	3.90	12.78	1.88	1.92	15.11
....	.....	*6.00*	*2.00*	*1.50*	*9.50*	*1.65*	*2.00*	*13.93*
1121	14.96	13.15	2.55	1.19	16.89	.....	.....	13.87
....	.....	*11.00*	*2.00*	*2.00*	*15.00*	.....	.....	*11.50*
1133	12.23	6.90	2.48	4.54	13.92	1.76	1.30	14.83
1152	11 58	6.72	2.56	4.69	13.97	1.84	1.39	15.01
....	.....	*7.50*	*2.50*	*2.00*	*12.00*	*1.75*	*1.00*	*15.13*
1161	14.57	10.95	4.70	1.45	17.10	.....	.....	13.62
....	.....	*13.00*	*2.00*	*2.00*	*17.00*	.....	.....	*13.30*
1134	15.47	12·29	2.14	1.82	16.25	.....	.....	12.77
....	.....	*11.00*	*2.00*	*2.00*	*15.00*	.....	.....	*11.50*
1122	12.79	9.08	2.15	1.50	12.73	1.95	1·65	17.54
1135	13.67	8.17	2.44	.90	11.51	2.26	2.29	18.31
....	.....	*7.50*	*2.50*	*2.00*	*12.00*	*1.75*	*1.00*	*15.13*
1136	13.47	8.93	2.60	.79	12.32	2.15	1.98	18.63
....	.....	*7.50*	*2.50*	*2.00*	*12.00*	*1.75*	*1.00*	*15.13*
1137	9.12	5.07	2.89	2.68	10.64	3.06	.90	16.22
....	.....	*7.00*	.....	.....	.....	*2.25*	*2.00*	*14.63*

Laboratory No.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	Southern Fertilizer Company, Atlanta, Ga.	
1153	SCOTT'S GOSSYP. PHOS.	Bourland & Atkins, Amory..... Guarantee.....
	Standard Guano & Chemical Co., New Orleans, La.	
1138	CHANPION FARMER'S CHOICE.....	J. L. Strahan & Co., Poplarville Guarantee .....
1139	GROUND BONE.....	J. L. Strahan & Co., Poplarville Guarantee .....
1123	MISS. HOME GUANO....	J. K. Kirkland, Quitman..... Guarantee.....
1140	PELICAN R. B. GUANO..	Wm. Atkinson-Foxworth Co. Col
1160	" " "	Wm. Atkinson, Bacot Co., Osyka Guarantee .....
1159	STAN. AM. SOL. GUANO.	Lilly & Dunn, Summit..... Guarantee .....
1125	THREEFOOT'S HIGH GR'D ENGLISH ACID PHOS..	J. D. Clark, Lauderdale..... Guarantee .....
	Tennessee Chemical Company, Nashville, Tenn.	
1116	OX BRAND BONE WITH AMMONIA AND POTASH	R. M. Bourdeaux & Co., Lau'dale Guarantee .....
1141	OX HIGH GRDE DIS. BONE	H. B. Lewis, Columbia..... Guarantee .....
	Threefoot Bros. & Co., Meridian, Miss.	
1124	THREEFOOT'S IMPROVED MIXTURE.....	Hand Bros., Quitman..... Guarantee .....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water-Soluble	Citrate-Soluble.	Insoluble.	Total.			
1153	12.10	9.24	1.44	.74	11.42	2.24	2.77	18.91
....	.....	*6.00*	*3.50*	*1.00*	*10.50*	*2.05*	*2.00*	*16.28*
1138	11.44	5.80	4.21	.70	10.71	1.82	1.92	16.06
....	.....	*4.00*	*4.00*	*1.00*	*9.00*	*1.65*	*1.50*	*13.23*
1139	4.90	.....	.....	.....	17.86	3.05	.....	16.55
....	.....	.....	.....	.....	*18.50*	*2.50*	.....	*15.50*
1123	10.27	7.60	3.82	1.33	12.75	2.20	2.90	19.44
....	.....	*4.00*	*5.00*	.....	.....	*1.65*	*2.00*	*14.62*
1140	16.57	6.20	1.58	1.54	9.32	1.93	1.61	14.06
1160	14.57	5.94	2.89	1.05	9.88	1.87	1.86	15.08
....	.....	*4.00*	*4.00*	*1.00*	*9.00*	*1.65*	*1.56*	*13.23*
1159	14.62	6.15	3.01	1.10	10.26	2.02	1.56	15.47
....	....	*4.00*	*4.00*	*1.00*	*9.00*	*1.65*	*1.50*	*13.23*
1125	11.97	9.80	7.35	.88	18.03	.....	.....	14.70
....	.....	*13.00*	*2.00*	.....	.....	.....	.....	*13.30*
1116	6.31	7.98	3.95	.99	12.92	1.10	1.09	15.37
....	.....	*6.00*	*4.00*	*1.00*	*11.00*	*.85*	*1.00*	*12.75*
1141	11.00	10.45	4.51	.69	15.65	.....	.....	13.01
....	.....	*8.00*	*6.00*	*1.00*	*15.00*	.....	.....	*12.00*
1124	10.19	7.32	2.53	1.66	11.51	2.00	2.29	16.89
....	.....	*8.00*	*2.00*	*1.00*	*11.00*	*1.75*	*2.00*	*16.18*

ANALYSES

—OF—

FERTILIZERS

—ON SALE—

IN MISSISSIPPI.

Fourth Monthly Edition, Season 1898-'99.

These bulletins will be sent free to any address upon application to State Chemist.

MISSISSIPPI AGRICULTURAL

EXPERIMENT STATION.

BULLETIN No. 58. MAY, 1899.

SOILS OF MISSISSIPPI: TEXTURE AND WATER CONDITIONS.

W. L. HUTCHINSON, DIRECTOR.

Soil Divisions.—In his Geology of Mississippi, and subsequently in his report on Cotton Production, for the Tenth Census, in 1870, Dr. Eug. W. Hilgard classified the soils of the state as follows, viz.:

1. Northeastern prairie region; including the Pontotoc ridge.
2. Flatwoods region.
3. Yellow and brown loam region.
4. Bluff or canehills region.
5. Alluvial or Yazoo Delta region.
6. Central prairie region.
7. Oak and hickory uplands region.
8. Pine woods region.

While such a classification has very little value for farmers, still, for purposes of description and reference, it is quite convenient. Farmers very naturally regard soils from a standpoint of productiveness, the ease with which they may be tilled, and the manner in which they

act towards water. In this way about all the soils in the state may be grouped into three classes:

1. Soils rich in plant food and with such texture as to furnish good water conditions.

2. Soils rich in plant food, but with water conditions poor or undesirable.

3. Soils with good water conditions, but deficient in plant food, and hence requiring the constant use of fertilizers.

After studying the virgin soils of Mississippi and the cotton states carefully, Dr. Hilgard was of opinion that, for an equal area, this state had as much rich soil as any state in the Union. When properly drained and cultivated the soils of the Yazoo Delta are justly regarded everywhere as typical fertile soils. In other sections of the state there are large areas of valleys and bottoms that, when properly drained and tilled, belong to the same class as the best Delta lands, though probably not quite so productive. Such valley lands constitute one-third or one-fourth of the cultivated land in the western part of the Northeastern prairie region. The best prairie lands, as well as the best lands in the brown loam section, when in good condition, deserve to be classed with the best and most productive lands in the state. These soils have never been fertilized, and it has not been necessary to use fertilizers in order to secure large yields.

In the pine woods region and in the oak and hickory uplands region, the amount of mineral plant food in the soil is small, and the lands in these sections require the constant use of fertilizers. But their texture is good; they respond liberally to every well-directed effort; they furnish an excellent place to put fertilizers; they are good soils.

Study of the Soils in the State. Appreciating the fact that the proper cultivation and management of soils is probably the most important thing in successful agriculture, and realizing that practical farmers must needs,

in future, give more attention to this subject, the Station has made it one of the principal lines for study and investigation.

Chemical and physical analyses of soils are valuable, but one should not depend entirely on these if he would be thoroughly familiar with all the conditions which have to do with the yield of crops, or, know the difficulties with which practical farmers have to deal. The chemists of the Station have collected, from cultivated fields, about two hundred and fifty samples of soil and made both chemical and physical analyses of them.

During the six or seven-hundred mile trip, through the country, for collecting samples, the apparent yield of the crops; the depth of the surface or cultivated soil; the manner of cultivation and drainage; the apparent texture of the soil, and the conditions affecting the supply of water for crops; the character and kind of natural plant growth on similar soils, were all recorded for use in interpreting the laboratory results. The different soils in the state are also being tested in pots each of which will hold about one hundred pounds, and so constructed as to give good control of the water supply. The yellow hill land on the College farm presents very unsatisfactory water conditions, and several acres of this are being used for field tests as to the best means of improving the texture and water conditions of a soil.

Texture, Water Supply and Productiveness. It is very well for soils to have large amounts of potash and phosphoric acid, but it is just as necessary that their **texture** be such as to allow the air to enter the soil and to circulate freely through it, and, also, to furnish a favorable supply of water for the crops that are to be grown. Practical farmers apparently never think of the fact that one of the most important things in a soil are the living germs, which all fertile soils contain. Some of these germs are favorable to the ends for which the farmer works, while others are unfavorable.

The best of them require a well drained, porous soil that they may get air, which is as necessary to them as it is to the farmer himself. These germs require moisture, but they do not want a soil saturated with water. They need organic matter for their growth and development, and from the nitrogen in this organic matter they make the necessary nitrates for growing crops. Crops must have **nitrates**, and the farmers of this state would do well to consider the fact that they depend entirely on the germs in their soils to furnish their crops this important plant food. The roots of plants need air as well as the stems and leaves. **Water is important.** The **texture** of the soil is of very great importance, for it has to do with the development and growth of plant roots; with the proper supply of water for crops; with the formation of nitrates by the growth and development of the proper germs in the soil. **In cultivating his soil, it is the business of the farmer to control the texture, and also, as far as he may, the supply of water for his crops.**

The system of farming which has been practiced in this state has not properly cared for soils; its sure result has been to make soils **poorer** each year. Our farmers would do well to so change their methods as to make their soils **better** each year. We need farmers who use good **judgment** in the management and cultivation of soils, and to this end, more than any other, perhaps, they need to know the value of a proper texture for soils and the functions of the soil in furnishing a proper supply of water. It is here that our farming operations are especially faulty. Good judgment, based upon a thorough knowledge of the objects and principles of tillage, and the functions of soils, should govern our farm operations and not a custom which always lessens fertility and productiveness and which has converted the fairest and most fertile lands into gullied and abandoned "old fields."

Advantage of Fertile Soils. The farmer, who persistently cultivates land that only yields a fourth, or a third, or a half a crop, is sure to work for small pay in

comparison with the man who secures a maximum yield. No good farmer should be satisfied to cultivate land unless it gives large yields. The man who produces one fourth or one-third of a bale of cotton per acre gets very little if anything for his labor, when cotton sells at five cents per pound, while the man who produces a bale or a bale and a half per acre,may receive good wages. It is the same with all crops. The man who is content to get only a part of a crop is sure to find farming unprofitable. Even at present prices **cotton** may be quite profitable to the producer if the yield be large, but, it is worse than folly to spend one's efforts growing cotton when the yield per acre is small. If one would produce **corn** at small cost per bushel the yield per acre must necessarily be large. The farmers of this State would do well to determine the unprofitable acres for cotton and corn and plant such in some crop that will return a profit, or else, increase their productiveness. It is a comparatively easy matter for Mississippi farmers to cultivate only such soils as will give large yields and the object of this bulletin is to direct their attention to the very great advantage in cultivating fertile soils, and to the further fact that the first thing needful to improve the lands in this state, and make them more productive is to give them better **texture** and **water conditions**.

Erosion and Soil Water. The never failing result of our system of cotton farming has been to wear out land, to injure the water conditions, to let it wash away. Some of the best land in the State, which should have lasted for all time, has been rendered almost worthless by erosion or washing. This practice still continues and the area of gullied land grows larger each year, and many seem to be wholly indifferent to this wholesale destruction of valuable soils. Other lands, once fertile, have constantly decreased in productiveness. The water conditions in these soil are not good. Let the farmers in this state learn to control water; control it so as to prevent washing; control it so as to have abundant water for crops during periods

of drouth and prevent injury during periods of wet weather, for this is one of the most important problems with which they have to deal.

Soils and Seasons. Farmers in this state fully appreciate the value of a proper supply of water for their crops. They generally admit that the **seasons** determine the yield and they sometimes plant on the dark of the moon in order to secure a proper water supply. **Soils** have much to do with the water supply for crops as well as the seasons. The farmer has no control over the seasons but he has entire control over the soil.

There probably is no appreciable change in the average weather conditions in Mississippi and consequently the seasons we have had for the last twenty years give an accurate idea of what we may expect in the future.

From forty to sixty inches of rain is sure to fall each year. There is just as sure to be periods of excessive rain and periods of drouth as well as rains which come in such manner and at such times as to be apparently of maximum benefit to growing crops. There will be **heavy rains** which as yet we do not control, and which are mainly responsible for all serious washing or erosion. This much at least farmers may expect of the seasons and their farming operations should be such as to prevent washing; to derive the greatest benefit from opportune rains; to lessen the ills of excessive wet weather; and, during periods of drouth, to conserve the water in the soil for the use of their crops.

If the **seasons** were always just right the growing of crops would be a perfectly simple operation. The best soils in this State produce good crops every year, and, at least, a small area of such may be found on every farm. The best soils will furnish abundant water for crops for a period of **six weeks** without rain. There are large areas in the State that, at present, are incapable of furnishing a proper supply for ten days of hot summer weather. Crops on such soils are sure to suffer and generally will

suffer severely. Farmers need to give more attention to their soils as agents for controling and furnishing the necessary water for crops. Badly managed and improperly tilled soils are far more responsible for our crop yields than the seasons. We cannot control the seasons but it is comparatively easy to change the character of a soil and it is through the medium of his soil that the farmer may do much to control the supply of water for his crops, and in a great many cases he may have it just as he wants it.

Amount of Water Needed by Plants. For every pound of dry matter produced by plants they require from 300 to 500 pounds of water. The tender roots of plants absorb water from the soil, it passes upward through the body or stem and is evaporated from the leaves. When the soil is dry and the evaporation from the leaves is greater than the amount of water entering at the roots, the plants wilt and if they remain in this condition too long they become permanently injured.

One inch of rainfall over an acre represents about 100 tons of water. To produce a ton of hay requires that 300 tons of water pass through the plant and be evaporated from the leaves. A fifty bushel corn crop requires about 1200 tons of water, and a crop of cotton yielding a bale, 900 tons. We thus see that six inches of rain over an acre furnishes enough water to produce two tons of hay and twelve inches, enough for a crop of fifty bushels of corn and nine inches, enough for a crop of cotton yielding a bale per acre. While these amounts are large they are not nearly so large as our annual rainfall. We nearly always have, **during the period of growth**, a greater rainfall than is needed for the production of maximum crops. If the soils of Mississippi were properly managed and tilled our crops would rarely suffer for the want of water.

THINGS WHIGH INFLUENCE SOIL WATER.

Clay and Sandy Soils. Every farmer is familiar with the marked difference between clay and sandy soils in their action towards water. Sandy soils being open and porous, water moves through them comparatively fast. The particles which compose **clay** soils are much smaller and the spaces between the particles are also small and the movement of water through them is very slow. Sandy soils till easily, while close compact clays are difficult to till. The flatwoods soils and the soils in the prairie regions are the only distinctively clay soils in the State. The soils in the yellow and brown loam region are characterized by a large amount of very fine material designated as **silt**, which determines their texture and also their action towards water. The valley and bottom soils usually have a loamy texture. In the pine woods region and in the oak, and hickory uplands region the surface soils are sandy or a sandy loam with subsoils of yellow or red clay, containing more or less sand, which gives them the texture of a clay loam.

Organic Matter or Humus. It is a compartively easy matter to change the texture of a soil with organic matter or humus. By turning under green crops a clay soil may be made open and porous, with a loam texture. In this way the surface soil may be made to cultivate like a loam and it will, also, so manifest itself towards water. Organic matter in sandy soils makes them more retentive of moisture and prevents the too rapid sinking of water downward to a depth where it can no longer be of use to plants. Our system of farming is prone to destroy and deplete the **organic** matter in our soils and in doing so the texture has been changed and this in turn makes them act differently towards water. The water supply is not so uniform or so good as formerly. Crops suffer more from extremes of wet and dry weather; the yields are less. Organic matter prevents land from baking or forming a

crust on the surface and also from running together after heavy rains. Cotton soils stand greatly in need of organic matter, and it should be added to them as rapidly as circumstances may permit.

Restorative Crops. Cowpeas, lespedeza, hairy vetch, melilotus and other leguminous or restorative crops improve our worn soils in a most wonderful manner. These crops may be cut for hay or grazed and the beneficial effect is still very great. It is often the case that the beneficial effect of a crop of cowpeas, where the vines were used for forage, is just as great as where the vines were plowed under. While these crops are usually considered from the standpoint of their fertilizing value, still not the least of their beneficial effect on cotton soils is the improvement which they make in the water conditions. In this State these crops produce unusually marked results, and probably their greatest good at this time is found in the beneficial influence which they have on the texture of the soil and on the supply of watter for succeeding crops. This gives to these plants a very great value for Mississippi farmers and they should be grown extensively in all parts of the State and in no section are they worse needed than in the northeastern prairie region. The soils in this region are rich in plant food and the decrease in their productiveness is not due to the exhaustion of the plant food but to the less favorable water conditions in the soil and a texture too much like **putty**. Commercial fertilizers do not, as a rule, increase the yields on these soils but melilotus, clover, and cowpeas readily restore good water conditions and make them among the most productive in the state and as much so as when this section was known as the "Egypt of the South."

Earth or Dust Mulch. During the hot weather of summer a large amount of soil water, for which the crops stand greatly in need, is lost by evaporation from the surface of the ground. Any kind of good mulch largely prevents this loss. While it may be profitable to mulch

certain garden crops with straw, cotton seed or cotton seed hulls yet for farm crops such a system is not practicable; but a very effective and good mulch may be made of the surface soil by means of harrows, cultivators, hoes, sweeps or other implements that will leave a thin or shallow layer of **fine loose earth** covering the surface of the ground. This earth mulch may become very dry itself but it will prevent evaporation from the soil below. **Summer tillage** should be shallow and frequent if the best results are to be had. In dry, hot weather untilled land loses water very fast by evaporation and hence it is best to run the cultivators through the entire crop just as soon as the ground is dry enough on the surface to cultivate in order that the soil mulch formed by the cultivators may prevent further loss of water from the lower soil; whether it rains or not the surface should be stirred sufficiently often to keep it detached from the soil below. Any plow that leaves a hard bare furrow or which does not leave the entire surface covered with loose earth is a poor implement for conserving moisture in the soil.

Ridge and Flat Culture. One should always be able to tell whether ridge or flat culture would be best. Ridge culture exposes more surface for evaporation and hence is always to be preferred where the effort is to get rid of an excess of water. Flat culture has less surface for evaporation and is better for conserving moisture in the soil. **Ridge** culture is often used in this State where flat culture would appearantly give better results. The extensive use of the moldboard plow in cultivating crops, even at the last plowing, appears to be wrong in principle; and to use some form of cultivator to mulch the surface and disturb the roots less would doubtless be a better practice.

OTHER DIVISIONS OF SOILS.

Valley and Bottom Lands. When properly drained the valley and bottom lands are the most productive and the most desirable lands in the State. Good drainage lowers the water level four feet below the surface where an abundant supply is always present and with their loamy texture such soils are almost as safe as **irrigated** lands. As a rule we have found these lands but poorly drained and improperly cultivated and their owners do not seem to appreciate their great value. Generally it is neither expensive nor difficult to drain these lands even for cotton and corn while there value for **grass** seems not to be considered. Where they are too low and wet for ordinary crops they could be put in grass for summer pasture.

There is such a large area of these valley and bottom lands in the State; it is so easy to make their water conditions the very best; they are so safe and productive that we desire to impress on their owners the fact that these are the best lands in the State and as good as may be found anywhere.

Brown Loam Soils. Between the canehills, or bluff, on the west, and the flatwoods on the east, are the brown and yellow loam lands, extending from the Tennessee line as far south as the counties of Hinds and Yazoo. Underlying this section is a deep deposit of sand or gravel. Covering this sand or gravel is a layer of fine material, of a brown or yellow color, and varying in thickness from one to twenty feet. This material has a loam texture, and usually contains more than fifty per cent of **silt.** Where these lands are rolling the formation and conditions are peculiarly favorable for washing and erosion, and some parts of it are already literally washed away. Where the silt layer is four feet thick or more the land originally was very productive, and no soils in the

state were more highly prized. Where the surface has been sufficiently level to prevent excessive washing, the lands in this section are still regarded as among the best. The yields obtained are not so large as when the lands were new, and the crops are more sensitive to the evil effects of unfavorable seasons. Except in localities where trucking is practiced, very little fertilizer is used in this section. Analysis indicates that the same kind of fertilization that pays best in the pinewoods section would give the best results in the brown loam section. The **potash** in these soils is four or five times as great as the phosphoric acid, and apparently it would be found profitable to use, on these lands, **phosphates** mixed with cotton-seed meal or cotton seed. Where these lands are rolling, and to cultivate them in cotton or corn means to wash them away in a few years, they should be kept sodded with grass. No soils in the state seem to be better adapted to bermuda, carpet grass, and hairy vetch; while none grow lespedeza so well as the silt soils of this region.

Basin Soils. In Neshoba, Scott, Leake, Winston, and Kemper counties, are small areas of very fine land known locally as basin land. The two largest bodies, of this character of soil, that we have seen, are in Neshoba county, and known as the Muckalusha and Yazoo basins. These lands are very similar to the best types of the brown loam, which they resemble very much in texture, color, and composition, Probably no upland soils in the state furnish such desirable water conditions, and in this respect they resemble the best drained valleys and bottoms, with which they deserve to be classed. They are undoubtedly among the best soils in the state. As they were cultivated by the Indians, no one knows how many crops they have produced, and hence they naturally stand in need of fertilization. The hills or elevated parts of these basins have a decided sandy texture and are a little too open and porous. They should have the benefit of an occasional crop of cow-peas, lespedeza, and hairy vetch.

A fertilizer, made by mixing 650 lbs. of cottonseed meal, 1150 lbs. of acid phosphate, and 200 lbs. of kainit, would apparently be well suited to the wants of these soils and should give good results.

Reedbrake Soils. In the same section of the state, where the basin lands occur, on the tops of hills and ridges, in the valleys and bottoms, occur what is locally known as reedbrake soils, which are subdivided into timbered and spongy reedbrake. The timbered reedbrake is nothing more than a fertile valley soil after it is properly ditched and drained; while the spongy reedbrake consists mainly of a mass of organic matter, more or less decayed, very much resembling a mass of leaf mold in the forest. Though these spongy reedbrakes are very fertile when first tilled, they soon wear out and only five or ten bushels of corn are made where formerly was obtained a yield of eighty bushels per acre. These worn out reedbrakes are very acid or **sour**, and the organic matter is so coarse as to give a texture so open and porous as to make it difficult to control a proper supply of water for crops. **Lime** applied at the rate of two tons per acre would correct the acidity and also hasten the decay of the organic matter, and would help to form a good quality of humus. Where soil farther up the valley or from the adjacent hills can be washed on to these spongy reedbrakes, it should be done, as it would convert them into similar soils to those of the timbered reedbrakes.

Sandy and Sandy Loam Soils. The soils of the pine woods region are either sandy or sandy loams with a clay or clay loam subsoil. In the oak and hickory uplands region the soils are of the same type, though both the surface and subsoils contain somewhat less sand.

The plant food in these soils is small, and this is especially true of phosphoric acid. This is the **fertilizer** region of the state, and these soils respond well to fertilizers consisting mainly of phosphates with a small amount of nitrogen. No soils in the state are more benefited by

cowpeas, and **restorative** crops should always be grown entensively in this section. Investigations in the laboratory indicate that these soils are acid and that they would be benefited by lime. From one to two thousand pounds of lime per acre on these soils would be sufficient. Lime should be slaked to a dry powder, applied broadcast and thoroughly harrowed in with the surface soil.

These soils are easily tilled; they have a desirable texture and manage water well; they respond liberally to any good treatment given them. They are ideal soils for truck farming, and by the use of cowpeas and fertilizers the yield of crops on them may be increased to the maximum.

Prairie Soils. The prairie soils, in the state, are as a rule, rich in the mineral elements of plant food and the present yield of crops on them is determined by their texture and the conditions which control the supply of water. They contain from forty to fifty per cent of clay and generally from a half to one per cent of lime though in some places the lime is as much as five and even fifteen per cent.

Restorative crops and proper tillage readily restore these lands so that they have a loamy texture and furnish a good water supply, the yields being doubled and even increased fourfold. Farmers in this section should make constant use of cowpeas, hairy vetch, red clover and melilotus. Where the lime rock comes to the surface melilotus is the best plant to use as it will make a good growth on the bare rock where nothing else will grow.

MISSISSIPPI

AGRICULTURAL AND MECHANICAL COLLEGE

EXPERIMENT STATION.

BULLETIN, No. 59.

Analyses

—OF—

Commercial Fertilizers on Sale in the State.

AGRICULTURAL COLLEGE, MISS.,

JUNE 15, 1899.

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MISSISSIPPI FERTILIZER CONTROL.

Inspection and Analyses of Fertilizers

BY THE CHEMICAL DEPARTMENT OF THE

MISSISSIPPI AGRICULTURAL AND MECHANICAL COLLEGE.

B. W. KILGORE, State Chemist,
W. F. HAND, Assistant Chemist,
E. W. MAGRUDER, Assistant Chemist,
J. S. CARROLL, Ass't Chem't and Fertilizer Insp'r.
W. S. WELCH, Assistant Chemist.

The analyses presented in this bulletin are of samples of fertilizers collected by the fertilizer inspector of this department. The analyses of samples sent to the department by manufacturers are not published because they do not always represent the true character of the goods actually put on sale. The samples, the analyses of which are presented in this bulletin, were taken from December to June from goods in the hands of fertilizer dealers, and therefore represent the composition of the fertilizers the farmers actually bought and used.

This is the fifth fertilizer bulletin for this season,

NOTE—The analysis and inspection of commercial fertilizers is by law done by the Professor of Chemistry at the College, who is State Chemist. The results being considered of agricultural value are sent out by the Experiment Station. All communications in regard to these Bulletins or analyses should be addressed to State Chemist.

1898-'99, four editions having been previously issued. These were gotten out January 15th, February 15th, March 15th, and May 15th. By these frequent and early publications during the growing season farmers were enabled in many cases to know the composition and character of their fertilizers before they bought and used them. This edition is the last one for the season, and includes the analyses of all samples made during the season, both those published in previous bulletins and those made since the last bulletin was issued.

Character of Business this Season.—The fertilizer season just passed has been a successful and satisfactory one so far as the character of the fertilizers offered for sale is concerned. The fertilizers sold were good and what they were represented to be as will be seen by a comparison of the analyses presented in this bulletin with the guarantees made by manufacturers. The fertilizer companies doing business in this State have been straightforward; they have kept their goods up to what they represented them to be; and have manifested a special disposition to comply with the requirements of the law.

The amount of fertilizer sold was eight per cent. short of the previous season, which is a better showing than was expected early in the season.

TERMS USED IN ANALYSES.

Nitrogen, Phosphoric Acid, and Potash are the three constituents in a fertilizer which give to it its value. They do not make up all of a fertilizer—in fact in most fertilizers other constituents are present in larger quantities than are these—but they are the only ones to which values need be assigned. The amounts of these constituents found in the fertilizers analyzed are expressed in the table as percentages or pounds in one hundred pounds of the fertilizer.

Four columns are given to phosphoric acid. In the first is found the water-soluble phosphoric acid, or the portion dissolved by cold water; in the second one is found the

citrate-soluble, or the portion soluble in ammonium citrate solution; in the third the portion not soluble in either water or citrate solution, but soluble in strong acid; in the fourth column is given the total phosphoric acid, or the sum of the preceding forms. The water-soluble and citrate-soluble represent the phosphoric acid immediately available for plant growth, and taken together are known as *available.*

Two sets of percentages are given in the table, "found" and "guaranteed." The percentages found represent the results actually obtained in the analysis of the fertilizers, while the guaranteed percentages are what the manufacturers claim them to contain.

VALUATIONS.

In order to have a basis of comparison for the different fertilizers, values are assigned to the three valuable ingredients—nitrogen, phosphoric acid, and potash. These valuations are not intended to represent *crop producing power or agricultural value,* but are *estimates of the commercial* value of nitrogen, phosphoric acid, and potash in the materials supplying them. While the valuations are only approximate, it is believed that they fairly represent the cost of making and putting the fertilizers on the market. They are based upon a careful examination of the trade conditions, wholesale and retail, and upon quotations from manufacturers.

The figures used in calculating the "relative value per ton" in this bulletin are the same as those used last season, and are as follows:

	Per pound.
For Nitrogen	12.5 cents
For potash	5 cents
For water-soluble phosphoric acid in mixed fertilizers	5 cents
For water-soluble phosphoric acid in unmixed acid phosphates	4.5 cents
For citrate-soluble phosphoric acid in mixed fertilizers	4.5 cents

For citrate-soluble phosphoric acid in unmixed acid phosphates..... 4 cents
For phosphoric acid in fine ground bone ..... 3 cents
For phosphoric acid in medium and coarse bone 2.5 cents

All relative values during this season will be calculated by the use of these figures.

HOW RELATIVE VALUES ARE CALCULATED.

It may not be clear to all how values per ton are calculated. To make this plain an example is given. It is to be remembered that the figures in the table represent pounds and parts of a pound of nitrogen, phophoric acid, and potash in one hundred pounds of the fertilizer, and that there are twenty hundred pounds in one ton (2,000 pounds).

The calculation is made as follows:

Percentage, or lbs. in 100.	*Value per 100 lbs.*	*Value per ton (2,000 lbs.)*
6 lbs. Water-sol. phos. acid at 5c per lb....	$0.30 x 20 =	$ 6 00
2 lbs. Citrate-sol. phos. acid at 4½c per lb..	0.09 x 20 =	1 80
2 lbs. Nitrogen at 12½c per lb.....	0.25 x 20 =	5 00
2 lbs. Potash at 5c per lb.....	0.10 x 20 =	2 00
Total value.....	$0.74 x 20 =	$14 80

DATA IN THE TABLES.

The data in the table will be readily understood. In it will be found the analyses of samples collected this season. Several analyses are given of most of the brands, together with the dealers selling them, and under the analyses will be found the average of all analyses made and the guarantees made by the manufacturer. A comparison of the analyses and average analysis with guarantee will show how well the goods sold agree with the claims made for them.

FERTILIZER LAW.

The fertilizer law is published here for the information of those who may not be familiar with it, and is taken from

Chapter 48, Annotated Code 1892, with amendments, 1896:

FERTILIZERS.

Definition of Term as Used: The term fertilizer, as used herein, includes all substances, chemicals and compounds commonly known as commercial fertilizers, and all manures, except animal excrement, cotton seed and unmixed cotton-seed products and castor pomace, whether natural or artificial products.

To be Analyzed by State Chemist—His Certificate: The Professor of Chemistry, at the Agricultural and Mechanical College, is State Chemist; and all fertilizers shall be analyzed by him, and his certificate of analysis, stating the percentage therein of nitrogen, in an available form, of potash soluable in water, and of phosphoric acid in an available form, soluable or reverted, and of insoluable phosphoric acid, shall be posted and kept posted, in a conspicuous manner, at every place where the same are sold.

Certificate by Manufacturer: There shall also be so posted the certificate of the manufacturer or producer of every brand of fertilizer, giving the component parts thereof, and the valuable elements, as prescribed for the State Chemist's certificate, and guaranteeing that it does not contain leather in any form, and giving the place of manufacture or production, the name and address of the manufacturer or producer, the name of the trade-mark of the brand, and such certificate, and the prescribed tag, shall be posted on, or attached to, every package of fertilizer sold.

Chemist to Analyze Samples and to Furnish Certificates and Tags: Before offering any fertizizer for sale, the manufacturer, producer, or seller, shall furnish to the State Chemist, a certifiicate of the manufacturer or producer, showing the component parts thereof, and a fair sample of it, not less than one pound, sealed up in a glass jar, and the Chemist shall analyze it and give his certificate thereof, and shall furnish the necessary number of tags; he shall also, from time to time, secure samples from packages offered for sale, or sold; analyze the same and record the analyses.

Chemist to Analyze Samples Sent by Farmers or other Purchasers: The State Chemist shall also analyze all fair samples of fertilizers properly certified and prepared which may be furnished to him by the farmers and other purchasers for use free of charge, and shall give a certificate thereof.

Certificate of Chemist as Evidence: The certificate of analysis of the State Chemist shall be evidence of the percentage of the valuable elements in any fertilizer analyzed by him.

Tags, How Supplied—Forgery to Counterfeit or Use a Second Time: The State Chemist shall have prepared a sufficient number of tags, of suitable material and form, with proper fastenings for attaching to packages, and having printed thereon the word "Guaranteed," with the year of sale, number of the tag, and a *fac simile* of his signature. Any person who shall counterfeit a fertilizer tag, or who shall use one not sold to him by the State Chemist, or who shall use one a second time, shall be guilty of forgery.

Fees for Analysis and for Tag: The State Chemist shall charge and collect for the analysis of each brand of fertilizer the sum of fifteen dollars, and for enough tags for one ton of fertilizers, thirty cents.

Fees—How Used and Accounted For: The fees received by the State Chemist shall be deposited with the Treasurer of the Agricultural and Mechanical College, and shall be expended, under the direction of the Board of Trustees, in detraying expenses of analyzing fertilizers, the preparation of tags and otherwise, as the Board shall allow or direct.

Certificate Good for One Season Only: The certificate of the State Chemist shall be good for one year, if no fraud or deception be practiced in obtaining it, and an analysis must be made every year or season of each brand of fertilizer.

Record of Tags Issued, and of Analysis, is to Kept: The State Chemist shall record, in a suitable book, the result of every analysis of fertilizer made by him, specifically showing the percentage of valuable elements, the date of the analysis, the name and residence of the manufacturer or

producer, the name of the brand and place of manufacture or production and the number of tags issued for each brand.

Kind of Package Fertilizer Sold In: Every fertilizer shall be sold and delivered in a barrel, box, sack or other package, convenient for handling, and suitable for having attached thereto the certificate and tag.

Manufacturer, Owner and Agent Liable for Damages: Every manufacturer, owner or agent, selling any spurious or adulterated fertilizer, or any fertilizer which shall lack materially in a valuable element represented to be therein, shall be liable to the person injured for quadruple the price received, or agreed upon for the article sold.

Adulterated Fertilizer Forfeited and Contracts Avoided: If any fertilizer shall be sold, offered or kept for sale, which is spurious or adulterated or which has not been analyzed by the State Chemist and tagged, or which shall lack materially any of the valuable elements specified in the certificate of analysis, the whole of that shipment of fertilizer shall be forfeited to the county wherein the same may be, and that, whether the fraud be perpetuated by the manufacturer or owner, or by an agent or servant or other person having control of it; and all contracts made for the sale of it, shall be void, *ab initio*, wherever stipulated to be performed.

Whenever the State Chemist or any other citizen shall make affidavit before any competent officer, that untagged or other fraudulent fertilizer is being sold, in violation of the provisions of this act, the officer shall issue a writ of attachment in the name of the State of Mississippi, returnable to the court having jurisdiction of the amount in controversy, and by virtue of said writ the sheriff or other competent officer shall seize the fertilizer mentioned and hold the same subject to the action of the court. The defendants shall be summoned to answer said attachment as defendants are required to be summoned under the general attachment laws of this State. And upon the order of the court the fraudulent, or untagged, or adulterated fertilizer becomes the property of the county wherein the same may be.

Fraudulent Fertilizer Formulas: Occasionally the department comes across a formula or recipe for making cheap fertilizers. Extraordinary claims are usually made for the value of such fertilizers and the privilege of using the formula is sold to farmers for from $2.00 to $5.00. One such formula came to the notice of the department this year. Farmers are charged $3.00 for the secret. The materials for making a ton of fertilizer by this formula could be bought for less than $1.00 and the user had to pay for them as well as for the formula. Some of the materials used in this formula (as is the case with all such formulas) have fertilizing value, but they are drug-store chemicals and are costly. Besides the quantities used as well as some of the materials, which have no fertilizing value, are so ridiculous as to leave no doubt as to the ignorance of the originator of the formula on the subject of fertilizers as well as of the requirements of plant growth. Fields cannot be fertilized from drug stores; and fertilizer formulas are peddled only by those who are ignorant or whose intent it is to deceive and defraud. The advice of this department is to pay no one for the right to make fertilizer by any recipe. The department is always ready to investigate and advise any farmer, without cost to him, in regard to any fertilizer or formula he may have or wish to use.

Uniform Methods of Stating Guarantees for Fertilizers: There is a movement on the part of chemists having charge of fertilizer inspection and manufacturers of fertilizers to have uniform printing on fertilizer bags and uniform statement of fertilizer guarantees in all the states. Such uniformity would be a great advantage to all parties concerned. It would simplify the work of State Chemists; farmers would not be confused by varied and double methods of stating the same things (as when nitrogen is stated and just under this the same thing is repeated in the ammonia equivalent of the nitrogen without regard to the form of nitrogen present); and the manufacturers of fertilizers would be saved expense and trouble by being able to use the same bags in

the different States in which they may be doing business. If uniformity is reached at all it will require time to bring about the necessary changes in present methods. Without going into further argument about the advantage to come from such uniformity, this department requests fertilizer manufacturers doing business in this State to conform as far as practicable, without incurring loss because of bags or other materials that may now be on hand, to the following scheme of printing bags and stating guarantees. In this scheme are embodied the points of uniformity thus far agreed upon as indicated above.

Pounds.....
Name of brand.....
Manufactured by.....
Address.....

GUARANTEED ANALYSIS.

Water-Soluble phosphoric acid.....per cent.
Reverted phosphoric acid.....per cent.
Insoluble phosphoric acid.....per cent.
Total phosphoric acid.....per cent.
Potash soluble in water.....per cent.
Nitrogen.....per cent.

It is requested that definite percentage guarantees be made in all cases and that the "sliding scale" method (Example: Nitrogen, 1 to 2 per cent.; instead put it 1 per cent. or 2 per cent.) of stating guarantees be discontinued.

Where it is desired to state the form of potash, let this go on the line with potash percentage in parenthesis as follows:

Potash soluble in water (in form of sulphate.)

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	A. D. ADAIR & MCCARTY BROS., Atlanta, Ga.	
1080	Buffalo Bone Fertilizer...	J. I. C. Hopkins, Iuka.....
		Guarantee.....
1082	Furman's H. G. Dissolved Bone.....	J. I. C. Hopkins, Iuka.....
1175	Furman's H. G. Dissolved Bone.....	H. S. Massey, Iuka.....
		Average.....
		Guarantee.....
1081	Furman's Sol. Bone, with Am. and Potash.....	J. A. Mehaffey, Columbus.....
		Guarantee.....
1174	Farish Furman Formula..	H. S. Massey, Iuka.....
		Guarantee.....
	ARMOUR PACKING CO., Kansas City, Mo.	
1037	Fertilizer No. 271.....	W. L. Wellman, Wesson.....
1150	Fertilizer No. 271.....	Bourland & Atkins, Amory.....
1173	Fertilizer No. 271.....	R. J. Shannon, Tiplersville.....
1203	Fertilizer No. 271.....	J. E. Ross & Bro., Pelahatchie.....
		Average.....
		Guarantee.....
1151	Fertilizer No. 272.....	Bourland & Atkins, Amory.....
		Guarantee.....
1183	Fertilizer No. 285.....	J. A. Mehaffey, Columbus.....
		Guarantee.....
	BIRMINGHAM FERTILIZER COMPANY, Birmingham, Ala.	
1117	Cahaba Acid Phosphate...	Meyers & Egger, Steenston.....
1189	Cahaba Acid Phosphate..	Meyers & Egger, Columbus.....
		Average.....
		Guarantee.....
1038	Prolific Acid Phosphate..	Threefoot Bros. & Co., Meridian....
1118	Prolific Acid Phosphate..	Hand Bros., Quitman.....
		Average.....
		Guarantee.....
1024	Birmingham H. G. Fertilizer.....	Gilmore & May, Amory.....
1090	Birmingham H. G. Fertilizer.....	Gilmore & May, Amory.....

Laboratory Number.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative value per ton.
		Water-soluble.	Citrate-soluble.	Insoluble.	Total.			
1080	12.62	8.70	1.29	1.28	11.27	1.72	2.04	$ 16.20
.....	.....	*6.00*	*3.00*	*2.00*	*11.00*	*1.75*	*2.00*	*15.08*
1082	11.85	9.93	2.05	.37	12.35	.....	.....	10.58
1175	13.08	10.93	2.30	.15	13.38	.....	.....	11.68
.....	**12.46**	**10.43**	**2.18**	**.26**	**12.87**	.....	.....	**11.13**
.....	.....	*8.00*	*4.00*	*2.00*	*14.00*	.....	.....	*10.40*
1081	13.14	9.01	1.80	1.23	12.04	.96	1.34	14.37
...	.....	*6.00*	*4.00*	*2.00*	*12.00*	*.85*	*1.00*	*12.73*
1174	14.29	10.02	2.20	.15	12 37	.....	2.22	14.22
.....	.....	*6.00*	*4.00*	*2.00*	*12.00*	.....	*2.00*	*11.60*
1037	5.90	3.52	4.98	.61	9.11	1.88	1.19	13.89
1150	3.89	3.59	5.97	1.02	10.58	1.92	1.38	15.14
1173	6.22	2.94	6.27	2.05	11.26	2.15	1.56	15.52
1203	5.72	3.19	5.76	3.22	12 17	2.10	1.34	14.96
.....	**5 43**	**3 31**	**5.75**	**1.72**	**10 78**	**2.01**	**1.37**	**14.88**
.....	.....	*5.00*	*2.00*	*1.50*	*8.50*	*1.50*	*1.00*	*11.55*
1157	7 19	3 77	4.88	.87	9.52	1.87	1.93	14.77
....	.....	*5.00*	*2.00*	*1.50*	*8 50*	*1.50*	*2.00*	*12.55*
1183	5.40	3.77	6.77	1.29	11.83	1.87	5.08	19.62
.....	... ..	.....	*8.00*	.....	.....	*1.65*	*5.00*	*16.33*
1117	9.57	9.07	3.49	2.52	15.08	.....	.....	10.95
1189	9.85	10.56	3.66	1.45	15 67	.....	.....	12.43
.....	**9 71**	**9 82**	**3.57**	**1 48**	**15.37**	.....	.....	**11 69**
.....	.....	*10.00*	*2.00*	*1.50*	*13.50*	.....	.....	*10.60*
1038	11.56	10 54	1.94	2.92	15.40	.....	.....	11.04
1118	11.72	11.59	2.52	.69	14.80	.....	.....	12.45
.....	**11.64**	**11.07**	**2.23**	**1.80**	**15.10**	.....	.....	**11.75**
.....	.....	*11.00*	*2.00*	*1.50*	*14.50*	.....	.....	*11.50*
1024	11 82	6.93	1.54	3.22	11.69	1.80	2.41	15.22
1090	15.19	9 43	1.04	.62	11.09	1.99	2.79	18.13

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
1128	Birmingham H. G. Fertilizer	Gilmore & May, Amory
		Average
		Guarantee
	CAPITAL CITY OIL MILL MANUFACTURING CO., Baton Rouge, La.	
1155	Capital Fertilizer	R. E. L. Coon & Co., Woodville
		Guarantee
	CAPITAL FERTILIZER CO., Jackson, Miss.	
970	High Grade Acid Phosphate	I. M. Eagan, Crystal Springs
1066	High Grade Acid Phosphate	Waddell, May & Barnes, Brandon.
1095	High Grade Acid Phosphate	A. E. Kelly, Kosciusko
1177	High Grade Acid Phosphate	G. H. Banks, Forest
		Average
		Guarantee
1039	Kainit	W. C. Wilkinson, Crystal Springs
		Guarantee
1026	Mississippi Guano	Max Priebatsch, Brookhaven
1176	Mississippi Guano	Moore Bros., Morton
		Average
		Guarantee
971	Nonpareil	E. L. Scott, Summit
972	Nonpareil	M. J. L. Hoye's Sons, Newton
973	Nonpareil	Becker, Lyell & McGrath Co. Wesson
1096	Nonpareil	J. H. Eddleman, Wiers
		Average
		Guarantee
975	Our Vegetable Grower	Hutchison & Co., Crystal Springs
1067	Our Vegetable Grower	Ford Bros. Co., Centreville
1204	Our Vegetable Grower	I. M. Eagan, Crystal Springs
		Average
		Guarantee
1178	Producer	Howard & Majors, Morton
		Guarantee
974	Red Star	Wm. Atkinson & McDonald, Wesson
1040	Red Star	W. C. Ellis, Steens Creek
1154	Red Star	S. Alcus, Summit

Laboratory Number.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative value per ton.
		Water-soluble.	Citrate-soluble.	Insoluble.	Total.			
1128	12.06	7.97	2.53	2.30	12.80	1.82	2.40	$ 17.20
.....	**13 02**	**8 11**	**1.70**	**2.05**	**11.86**	**1.87**	**2.53**	**16.85**
.....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.64*	*2.00*	*14.90*
1153	10 36	6.45	3.99	.65	11.09	2.88	1.83	19.07
. ...	.....	*6 50*	*1.50*	*1.00*	*9.00*	*2.00*	*1.70*	*14.55*
970	12.15	10.77	2.59	.44	13.80	.....	.....	11.77
1066	14 38	11.17	2.22	..50	13.89	.....	.....	11.83
1095	10.05	7.80	5.12	.67	13.59	.....	.....	11.12
1177	11.90	9.31	3 48	.31	13 10	.....	.....	11.16
.....	**12.12**	**9.76**	**3 35**	**.48**	**13.59**	.....	.....	**11.47**
.....	.....	*10.00*	*2.00*	*.50*	*12.50*	.....	.....	*10.60*
1039	5.71	.....	.....	.....	.....	... .	12 74	12.74
.....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1026	12 82	7.11	2.48	.51	10.10	1.60	1 76	15.10
1176	10.57	6 84	3.10	.49	10.43	1.50	2.95	16.33
... .	**11 69**	**6.97**	**2.79**	**.50**	**10 26**	**1 55**	**2.35**	**15.71**
....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1 50*	*2.00*	*14.55*
971	12.77	6.73	2.92	.43	10.08	1.50	2.15	15.26
972	10.73	8 06	2 36	.46	10.88	1.58	2.09	16.22
973	12.53	6.92	2.49	.49	9.90	1.58	2.23	15.34
1096	10.17	7.23	2.72	.31	10.26	1.57	2.16	15.76
.....	**11.55**	**7 23**	**2 62**	**.42**	**10 28**	**1.56**	**2.16**	**15 65**
.....	....	*7.00*	*2.00*	*1.50*	*10.50*	*1.50*	*2.00*	*14.55*
975	9.05	5.10	2.45	.37	7 92	2.49	6 22	19.75
1067	10.09	5.5I	2.74	.42	8.67	2.56	6.24	20 62
1204	8.84	4.76	3 20	.37	8.33	2.45	4.42	18.18
.....	**9.33**	**5 12**	**2 79**	**.39**	**8 31**	**2.50**	**5 63**	**19.51**
... ..	.....	*6.00*	*2.00*	*1 00*	*9.00*	*2.25*	*3.50*	*16.93*
1178	11.20	7.00	2 73	.73	10.46	1.41	2.45	15.43
.....	.....	7.00	2.00	1.50	10 50	1.50	2.00	14.55
974	14.10	6.94	2.5I	.68	10.13	1.63	1.98	15.25
1040	12.04	7 48	2.19	.36	10.03	1.83	2.23	16.26
1154	10.44	7.02	3.71	.50	11.23	1 40	2.78	16.64

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
		Average
		Guarantee
	CONTINENTAL FERTILIZER CO., Nashville, Tenn.	
1078	Sunny South Acid Phos.	J. A. Mehaffey, Steenston
		Guarntee
1079	Eddystone Sol. Guano	J. A. Mehaffey, Columbus
		Gaurantee
	THE GOULDING FERTILIZER CO., LIMITED. Pensacola, Fla.	
1083	Goulding's H.G. Acid Phos	D. D. Richardson, Columbus
1184	Goulding's H.G. Acid Phos	D. D. Richardson, Columbus
		Average
		Guarantee
	JACKSON FERTILIZER CO. Jackson, Miss.	
976	High Grade Acid Phos.	W. H. Chambliss, Newton
1068	High Grade Acid Phos.	Lotterhos & Huber, Crystal Springs
1179	High Grade Acid Phos.	J. M. Stephenson, Morton
		Average
		Guarantee
1027	Gulf States Guano	Mayes & Berry. Hazlehurst
1097	Gulf States Guano	T. C. Simmons, Magnolia
		Average
		Guarantee
977	Royal C	Earns, Long & Co., Wesson
978	Royal C	W, H. Chambliss, Newton
1036	Royal C	The Mills—Evans Co., McComb City
1069	Royal C	Gallman Mercantile Co., Gallman
1130	Royal C	Abney & Travis, Heidelberg
1156	Royal C	G. I. Ragsdale, Hazlehurst
		Average
		Guarantee
1157	Lotterhos & Huber's Tomato Grower	Lotterhos & Huber, Crystal Springs
		Guarantee
979	Vegetable Fruit Fertizer.	Lotterhos & Huber, Crystal Springs
		Guarantee

Laboratory Number.	Moisture - Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative value per ton.
		Water-soluble.	Citrate-soluble.	Insoluble.	Total.			
....	**12.19**	**7.15**	**2.80**	**.51**	**10.46**	**1.62**	**2.33**	$ **16.05**
.....	.....	*7.00*	*2.00*	*1.50*	*10.50*	*1.50*	*2.00*	*14.55*
1078	10 56	11.69	2.23	.33	14.25	.....	.....	12.30
.....	.....	*10.00*	*3.00*	*1.00*	*14.00*	.....	.....	*11.40*
1079	8.61	7.54	3.12	1.18	11 84	1.57	1.26	15 53
.....	.....	*7.00*	*2.00*	*1.00*	*10.00*	*1.65*	*1.00*	*13.93*
1083	12.34	12.09	4.67	2.23	18.99	.....	.....	14.61
1184	11.86	13.02	3.39	2.65	19.06	.....	....	14.43
.....	**12.10**	**12.55**	**4.03**	**2.44**	**19.02**	.....	.....	**14.52**
.....	.....	*12.00*	*3.00*	*1.00*	*16.00*	.....	.....	*13.20*
976	12 03	11 53	1.92	.97	14.42	.....	.....	11.91
1068	11.84	10.54	2.58	.74	13 84	.....	.....	11.55
1179	13.44	10.23	2 45	.93	13 61	.....	.....	11.17
.....	**12.44**	**10.76**	**2.32**	**.88**	**13.96**	.....	.....	**11 54**
.....	.....	*10.00*	*2.00*	*2.00*	*14 00*	.....	.....	*10.60*
1027	22.42	7.18	1.88	1.88	10.94	1.65	1.80	14.80
1097	16 69	7.64	2.92	.73	11.29	1.74	1.80	16.42
.....	**19.55**	**7.42**	**2.40**	**1.30**	**11.12**	**1 69**	**1.80**	**15 61**
.....	.....	*6.00*	*1.60*	*1.00*	*8.60*	*1.55*	*1.80*	*13.12*
977	22.35	7 27	2.57	.32	10.16	1.78	1.95	15 98
978	20.14	7.40	2.22	.67	10.59	1.70	1.90	15.55
1036	21.85	7.15	2.20	1.88	11.23	1.61	1.67	14.83
1069	20 55	7.07	2.40	1.92	11.39	1.71	1.89	15.39
1130	19.01	7.41	2.50	1.79	11.70	1.58	1.83	15.44
1156	15.80	7.62	2.55	1.24	11.41	1.80	2.03	16.45
.....	**19.95**	**7.32**	**2.41**	**1.30**	**11 08**	**1.69**	**1.88**	**15.60**
.....	.....	*6.00*	*1.60*	*1.00*	*8.60*	*1.55*	*1.80*	*13.12*
1157	13.82	8.32	2.43	2.06	12.81	2.56	2.79	19.70
.....	.....	*6.00*	*4.00*	*1.00*	*11.00*	*2.40*	*1.00*	*16.60*
979	14.46	5.07	2.06	.36	7.49	3.26	4.47	19.54
.....	.....	*3.00*	*3 00*	*1.00*	*7.00*	*3.00*	*4.00*	*17.20*

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	Sold by MARBACH & EAGAN, Crystal Springs, Miss.	
980	Bat Guano	I. M. Eagan, Crystal Springs
1047	Bat Guano	P. H. Traweek, Gallman
1205	Bat Guano	Robinson Mer. Co., Centreville
		Average
		Guarantee
	MERIDIAN FERTILIZER FACTORY, Meridian, Miss.	
1028	English Acid Phosphate	A. E. Dalrymple, Amory
1041	English Acid Phosphate	Bonner Bros., Sandersville
1131	English Acid Phosphate	Turner Bros., Vossburg
		Average
		Gurantee
986	Meridian Acid Phosphate.	W. B. Richardson, Newton
1043	Meridian Acid Phosphate.	Phillips, Hinds & Co., Booneville
1089	Meridian Acid Phosphate.	Lann & Carter H'dw. Co., Aberdeen
1102	Meridian Acid Phosphate.	O. B. Cooke, Maben
		Average
		Guarantee
1029	Meridian Blood and Bone.	A. E. Dalrymple, Amory
1042	Meridian Blood and Bone.	Holmes Bros., McComb City
1101	Meridian Blood and Bone.	T. W. Ford, Eupora
		Average
		Guarantee
1030	Meridian Farmer's Friend	S. Cohn & Sons, Magnolia
1115	Meridian Farmer's Friend	A. E. Dalrymple, Amory
1206	Meridian Farmer's Friend	T. B. Gaddis, Morton
		Average
		Guarantee
982	Meridian Home Mixture	J. McGrath & Sons, Brookhaven
983	Meridian Home Mixture	Walton, Gallaspy & Russell, Hickory
984	Meridian Home Mixture	J. P. Myer, Ellisville
1044	Meridian Home Mixture	J. L. Miller, Gallman
1070	Meridian Home Mixture	W. J. Bell, Pelahatchie
1219	Meridian Home Mixture	B. F. Harris, State Line
		Average
		Guarantee
981	Kainit	W. H. Barron & Co., Crystal Sp'gs.

Laboratory Number.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative value per ton.
		Water-soluble.	Citrate-soluble.	Insoluble.	Total.			
980	18.35	.....	.....	.....	6.59	4.96	1.19	17.53
1047	25..28	.....	.....	.....	7.35	4.12	.93	15.64
1205	20.56	.....	.....	.....	7.74	4.50	1.07	16.96
.....	**21.39**	.....	.....	.....	**7.23**	**4.53**	**1.06**	**16.71**
.....	.....	.....	.....	.....	*5.00*	*4.25*	*.65*	*14.28*
1028	15.27	11.46	3.55	.54	15.55	.....	.....	13.16
1041	15.87	11.58	3.12	.78	15.48	.....	.....	12.92
1131	13.12	11.51	5.37	2.43	19.31	.....	.....	14.65
.....	**14.75**	**11.52**	**4.01**	**1.25**	**16.78**	.....	.....	**13.58**
.....	.....	*10.00*	*2.50*	*.50*	*13.00*	.....	.....	*11.00*
986	15.99	13.37	1.94	.49	15.80	.....	.....	13.59
1043	16.08	11 58	2.75	.81	15.14	.....	.....	12.62
1089	15.79	12.06	3.42	.60	16.08	.....	.....	13.59
1102	12 68	12.31	4.01	.70	17.02	.....	.....	14.29
.....	**15.13**	**12.33**	**3.03**	**.65**	**16.01**	.....	.....	**13.52**
.....	.....	*12.00*	*2.50*	*1.00*	*15.50*	.....	.....	*12.80*
1029	15 99	8.80	2.45	2.89	14.22	1.42	1.61	16.17
1042	17.26	8.31	2.92	1.32	12.54	1.48	1.78	16.42
1101	13.77	8.53	2.93	2.38	13.84	1.63	1.55	16.79
.....	**15.67**	**8.55**	**2.76**	**2.19**	**13 53**	**1.51**	**1.65**	**16.46**
.....	.....	*7.75*	*2.00*	*2.50*	*12.25*	*1.65*	*1.85*	*15..53*
1030	15.48	9.21	2.06	1.05	12.32	1.41	2.11	16.70
1115	11.28	7.79	3.33	.88	12.00	1.94	1.99	17.63
1206	12.14	8.50	3.59	2.04	14.13	1.67	1.74	17.65
.....	**12.96**	**8.50**	**2.99**	**1.66**	**12.81**	**1.67**	**1.95**	**17.32**
.....	.....	*8.00*	*2.50*	*1.00*	*11.50*	*1.25*	*1.50*	*14.88*
982	12.17	8.45	3.01	.81	12.27	1.75	2.11	17.64
983	13.22	8.25	2.35	1.04	11.64	2.81	2.28	19.67
984	13 12	8.02	2.12	.75	10.89	1.76	2.18	16.51
1044	11.50	8.37	2.54	.47	11.38	1.68	1.91	16.77
1070	13.67	7.45	2.00	.41	9 86	1.90	2.24	16.24
1219	11.54	6.63	2.10	1.75	10.48	1.91	2.56	15.86
.....	**12.53**	**7.86**	**2.35**	**.87**	**11.09**	**1.97**	**2.21**	**17.11**
.....	.....	*7.75*	*2.00*	*1.00*	*10.75*	*1.75*	*1.85*	*15.78*
981	3.71	.....	.....	.....	.....	.....	13.02	13.02

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
1207	Kainit	J. L. Miller, Gallman
		Average
		Guarantee
985	Meridian Soluble Guano.	Wm. Atkinson & McDonald, Wesson
1158	Meridian Soluble Guano.	T. C. Simmons, Magnolia
		Average
		Guarantee
1045	Meridian Vegetable Grower	Hattiesburg Comp. Co., Hattiesburg
1119	Meridian Vegetable Grower	J. L. Miller, Gallman
1208	Meridian Vegetable Grower	W. H. Barron & Co., Crystal Spri'gs
		Average
		Guarantee
	MOBILE PHOSPHATE AND CHEMICAL CO., Mobile, Ala.	
1031	Eclipse Soluble Guano	J. M. Stephenson, Morton
1104	Eclipse Soluble Guano	Grunenold & Loewenberg, McCool
1120	Eclipse Soluble Guano	R. W. Fagan & Co., Waynesboro
		Average
		Guarantee
1180	English Acid Phosphate	Dr. C. C. Ewing, Aberdeen
		Guarantee
987	I. X. L. Acid Phosphate	Winner & Meyer, Meridian
1010	I. X. L. Acid Phosphate	W. J. Hubbard, Shuqualak
1046	I. X. L. Acid Phosphate	S. J. Johnson, Ellisville
1071	I. X. L. Acid Phosphate	J. E. Buckley, Enterprise
1103	I. X. L. Acid Phosphate	Thomas & Hortley, Maben
		Average
		Guarantee
988	Kainit	Winner & Myer, Meridian
1132	Kainit	E. F. Nunn & Co., Shuqualak
		Average
		Guarantee
1105	K. K. K. Soluble Ammoniated Bone	W. B. Potts Co., Kosciusko
1106	K. K. K. Soluble Ammoniated Bone	Seward & Gaston, Ackerman

Laboratory Number.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative value per ton.[a]
		Water-soluble.	Citrate-soluble.	Insoluble.	Total.			
1207	4.43	.....	.....	.....	.....	.....	12.94	$ 12.94
.....	**4.07**	.....	.....	.....	.....	.....	**12.98**	12.98
.....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
985	13.84	6 64	3.21	.86	10.71	1.74	2.19	16.07
1158	9.36	6.46	2.87	2.23	11 56	2.40	2.18	17.22
.....	**11 60**	**6.55**	**3.04**	**1 54**	**11.13**	**2.07**	**2.18**	**16 64**
.....	.....	*7.75*	*2.00*	1 *00*	*10.75*	*1.75*	*1 85*	15.*78*
1045	10.75	5.99	2.34	.65	8.98	2.69	6.25	21.07
1119	10.32	6.49	2.26	.45	9.20	2 65	5.30	20.45
1208	10 04	5.25	2 42	1.15	8.82	2.46	5.88	19.46
.....	**10.37**	**5.91**	**2 34**	**.75**	**9.00**	**2 60**	**5.81**	**20.33**
.....	.....	*5 00*	*1.00*	*.50*	*6.50*	*2.50*	*6.00*	*18.15*
1031	10.77	5.48	2.73	3.74	11.95	1.65	1.72	13.78
1104	8.89	4.77	3 51	3 24	11.52	1.80	1.94	14.37
1120	11.12	6.10	3.24	2.62	11.96	1.95	1.95	15.84
.....	**10.26**	**5.45**	**3..16**	**3.20**	**11.81**	*1.***80**	**1.87**	**14.66**
.....	.....	*6.00*	*2 00*	*1.50*	*11.50*	*1..65*	*2 00*	*13.93*
1180	12.63	9.90	4.41	1.43	15.74	.....	.....	12.44
.....	.....	12.00	2.00	1 00	15.00	.....	.....	12.40
987	13.29	13.05	3.04	.58	16.67	.....	.....	14.18
1010	16.24	13.96	1.98	.24	16.18	.....	.....	14.19
1046	14.31	11..16	2 26	.63	14.05	.....	.....	11.84
1071	14.58	10.46	3.18	.24	13.88	.....	.....	11.96
1103	11.83	11.41	3 02	1.42	15.85	.....	.....	12 69
.....	**14.05**	**12.01**	**2.70**	**.62**	**15 32**	.....	.....	**12.97**
.....	.....	*10.00*	*2 00*	*1.50*	*13.50*	.....	.....	*10.60*
988	4 86	.....	.....	.....	.....	.....	11.92	11.92
1132	4 00	.....	.....	.....	.....	.....	12.60	12.60
.....	**4 43**	.....	.....	.....	.....	.....	**12.26**	**12.26**
.....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1105	12 55	7.78	3.92	2 33	14 03	1.10	1.25	15.31
1106	10.44	6 84	4.36	1 87	13.07	.92	.78	13.85

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
1209	K. K. K. Soluble Ammoniated Bone	Fatherree, Hardee & Co., Pachuta.
		Average
		Guarantee
989	Mobile Standard	Winner & Myer, Meridian
1006	Mobile Standard	W. J. Hubbard, Shuqualak
1072	Mobile Standard	J. L. Wells, Hickory
1107	Mobile Standard	J. N. Alexander, Kosciusko
1129	Mobile Standard	Gilmore & May, Amory
		Average
		Guarantee
	NEW ORLEANS ACID AND FERTILIZER CO., New Orleans, La.	
1048	Black Diamond Acid Phos	Robinson Mer'tile Co., Centreville
1032	Black Diamond Acid Phos	G. W. Walton, Hickory
1121	Black Diamond Acid Phos	R. W. Carter, Iuka
		Average
		Guarantee
990	Blood, Bone and Potash	Louis Cohn & Bros., Brookhaven
1133	Blood, Bone and Potash	W. W. Pigford, Lumberton
1152	Blood, Bone and Potash	Bourland & Atkins, Amory
		Average
		Guarantee
1134	Crescent City Acid Phos	W. I. Heidelberg, Heidelberg
		Guarantee
1073	Dissolved Bone	Hawkins & Co., Hattiesburg
1161	Dissolved Bone	Louis Bendat, McComb City
		Average
		Guarantee
1122	Gold Dust	R. W. Carter, Iuka
1135	Gold Dust	N. P. Welborn & Co., Laurel
1210	Gold Dust	F. H. Hartman, Brookhaven
		Average
		Guarantee
991	Goldsmith's Imp. Mixture.	Louis Cohn & Bros., Brookhaven
992	Goldsmith's Imp. Mixture.	Earns, Long & Co., Wesson
1049	Goldsmith's Imp. Mixture.	Peets & Norman Co., Hazlehurst
1136	Goldsmith's Imp. Mixture.	W. I. Heidelberg, Heidelberg
1211	Goldsmith's Imp. Mixture.	G. S. Weems, Shubuta
		Average
		Guarantee

Laboratory Number.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative value per ton.
		Water-soluble.	Citrate-soluble.	Insoluble.	Total.			
1209	11.05	6.72	5.12	1.65	13.49	1.09	1.23	$ 15.28
.....	**11 33**	**7.11**	**4 46**	**1.95**	**13.53**	**1 04**	**1 09**	**14.81**
.....	.....	*8.75*	*1.25*	*1.50*	*11.50*	*.85*	*1.00*	*13 00*
989	11.92	6.82	2.88	2..84	12 54	1.74	2.09	15 85
1006	13.61	7.37	1.65	4.01	13.03	1.98	2 15	15 95
1072	13.42	5.10	4.47	.99	10 56	1.96	1.95	15.97
1107	9.49	4.48	3.40	3.11	10.99	1.79	1.91	13 93
1129	10.47	5.01	3 87	3.90	12.78	1.88	1.92	15 11
.....	**11.78**	**5 76**	**3.25**	**2 97**	**11 98**	**1 87**	**2 00**	**15 36**
.....	.....	*6.00*	*2 00*	*1.50*	*9.50*	*1.65*	*2.00*	*13.93*
1048	16 08	12 98	1.62	1.65	16.25	.....	.....	12.98
1032	15.91	12.79	1.50	1.92	16.21	.....	.....	12.71
1121	14.96	13 15	2.55	1.19	16.89	.....	.....	13.87
.....	**15 65**	**12 97**	**1 89**	**1.58**	**16 45**	.....	.....	**13.19**
.....	.....	*11.00*	*2.00*	*2.00*	*15.00*	.....	.....	*11.50*
990	12.49	6.82	2.35	4.77	13.94	1.77	2.11	15.47
1133	12.23	6 90	2 48	4.54	13 92	1.76	1.30	14.83
1152	11.58	6.72	2 56	4.69	13.97	1.84	1.39	15.01
.....	**12.10**	**6.81**	**2 46**	**4.33**	**13..94**	**1 79**	**1.60**	**15.10**
.....	.....	*7.50*	*2.50*	*2.00*	*12.00*	*1.75*	*1.00*	*15.13*
1134	15.47	12.29	2.14	1.82	16.25	.....	.....	12.77
.....	.....	11.00	2.00	2.00	15.00	.....	.....	11.50
1073	16.83	13.79	2 23	.55	16.57	.....	.....	14.19
1161	14.57	10 95	4.70	1.45	17.10	.....	.....	13.62
.....	**15.70**	**12.37**	**3 46**	**1.00**	**16.83**	.....	.....	**13 40**
.....	.....	*13.00*	*2.00*	*2.00*	*17.00*	.....	..	*13.30*
1122	12.79	9.08	2.15	1.50	12.73	1.95	1.65	17.54
1135	13.67	8..17	2.44	.90	11.51	2.26	2.29	18.31
1210	11.68	8 88	2.91	.96	12.75	1.97	1.98	18 40
.....	**12.71**	**8 71**	**2.50**	**1.12**	**12 33**	**2 06**	**1.97**	**18 07**
.....	.....	*7.50*	*2.50*	*2.00*	*12.00*	*1.75*	*1.00*	*15.13*
991	13.36	7.89	2.31	.88	11.08	2 19	1.42	16.86
992	12.41	8.12	2.47	1.47	12.06	2.08	1.85	17.39
1049	12 83	7.87	2.65	1.14	11.66	2.15	1.94	17.57
1136	13.47	8 93	2.60	.79	12 32	2.15	1 98	18.63
1211	11.56	8.58	3 50	1.64	13.72	1 69	1.68	17 64
.....	**12.72**	**8 28**	**2 70**	**1 18**	**12.37**	**2 05**	**1.78**	**17.62**
.....	.....	*7.50*	*2.50*	*2.00*	*12.00*	*1.75*	*1.00*	*15.13*

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	PLANTERS' FERTILIZER COMPANY, New Orleans, La.	
1162	Acid Phosphate	G. P. McGehee, Gloster
		Guarantee
1051	Cotton and Corn	Boyd & Lee, Wesson
1137	Cotton and Corn	Pittman, Rawls & Co., Columbia
1212	Cotton and Corn	M. Rothchild & Bro., Woodville
		Average
		Guarantee
	SOUTHERN FERTILIZER COMPANY, Atlanta, Ga.	
1182	Scott's Acid and Meal Formula	Bourland & Atkins, Amory
		Guarantee
1181	Scott's Blood Formula	Bourland & Atkins, Amory
		Guarantee
1153	Scott's Gossypium Phospho.	Bourland & Atkins, Amory
		Guarantee
	STANDARD GUANO AND CHEMICAL CO., New Orleans, La.	
997	Acid Phosphate	S. J. Johnson, Ellisville
1053	Acid Phosphate	S. J. Taylor, Enterprise
1074	Acid Phosphate	Eugene Simpson Co., Terry
		Average
		Guarantee
993	Blood, Bone and Meat Guano	S. J. Johnson, Ellisville
1108	Blood, Bone and Meat Guano	Hyman Mercantile Co., Summit
1213	Blood, Bone and Meat Guano	E. B. McLain, Gloster
		Average
		Guarantee
1033	Champion Farmers Choice	S. Wolf, Osyka
1076	Champion Farmers Choice	E. M. Carter, Centreville
1138	Champion Farmers Choice	J. L. Strahan & Co., Poplarville
		Average
		Guarantee

Laboratory Number.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative value per ton
		Water-soluble.	Citrate-soluble.	Insoluble.	Total.			
1162	12.80	10.75	2.57	.12	13.44	.....	.....	$ 11.73
....	.....	*14.00*	.....	.....	.....	.....	.....	*12.60*
1051	11.04	6.81	1.75	.19	8.75	1.92	2.19	15.37
1137	9.12	5 07	2.89	2.68	10.64	3.06	.90	16.22
1212	9.46	5.71	1 94	.09	7.74	2.20	2.16	15.12
.....	**9 87**	**5 87**	**2 19**	**.98**	**9 04**	**2 39**	**1 75**	**15 57**
....	.....	*7.00*	.....	.....	.....	*2.25*	*2.00*	*14.63*
1182	12.87	11.25	1.19	1.01	13.45	1.06	1.44	16.41
.....	.....	*7.00*	*3.00*	*1.00*	.....	*.83*	*1.00*	*12.77*
1181	12.93	10 61	1.27	1.74	13.62	1.03	1.49	15.82
.....	.....	*7.00*	*3.00*	*1.00*	.....	*.83*	*1.00*	*12.77*
1153	12 10	9.24	1.44	.74	11.42	2.24	2.77	18.91
.....	.....	*6.00*	*3.50*	*1.00*	*10.50*	*2.05*	*2.00*	*16.28*
997	13.09	10.57	5.88	.46	16.91	.....	.....	14.22
1053	12.09	10.91	4.58	.96	16.45	.....	.....	13.48
1074	13 88	10.40	5..65	.72	16.77	.....	.....	13.88
.....	**13.02**	**10 63**	**5 37**	**.71**	**16.71**	.....	.....	**13.86**
....	....	*10.00*	*2.00*	*1.00*	*13.00*	.....	.....	*10.60*
993	12.06	8.10	2.53	1.59	12 22	2.20	2.64	18.52
1108	10 59	6 60	3 00	1.02	10 62	2.24	3.24	18.14
1213	10 53	5 80	3.72	.68	10 20	2.75	2 21	18.23
.....	**11 06**	**6.83**	**3 08**	**1 10**	**11.01**	**2.40**	**2.70**	**18 30**
.....	.....	*4.00*	*4.25*	.....	.....	*1.70*	*2.00*	*14.08*
1033	11 63	6.37	3 14	.74	10.25	2.29	1.46	16.39
1076	11 58	6.42	2.88	.63	9.93	2.24	1.84	16.45
1138	11.44	5.80	4.21	.70	10.71	1.82	1 92	16.06
.....	**11 55**	**6 20**	**3 41**	**.69**	**10 30**	**2 12**	**1 74**	**16 30**
.....	.....	*4.00*	*4.00*	*1.00*	*9.00*	*1.65*	*1.50*	*13.23*

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
1034	Ground Bone	Wm. Atkinson—Bacot Co., Osyka
1139	Ground Bone	J. L. Strahan & Co., Poplarville
1109	Ground Bone	Lampton Mercantile Co., Magnolia.
1214	Ground Bone	S. Wolf, Osyka
		Average
		Gaurantee
1215	Kainit	Hyman Mercantile Co., Summit
1035	Kainit	Wm. Atkinson—Bacot Co., Osyka
		Average
		Guarantee
994	Mississippi Home Guano	Hattiesburg Comp. Co., Hattiesburg
1123	Mississippi Home Guano	J. K. Kirkland, Quitman
1216	Mississippi Home Guano	M. J. L. Hoye's Sons, Newton
		Average
		Guarantee
1140	Pelican R. B. Guano	Wm .Atkinson—Foxworth Co., Columbia
1160	Pelican R. B. Guano	Wm. Atkinson—Bacot Co., Osyka
		Average
		Guarantee
1159	Standard Am. Sol. Guano	Lilly and Dunn, Summit
		Guarantee
995	Stern's Am. R. B. Superphosphate	B. F. Fridge, Ellisville
996	Stern's Am. R. B. Superphosphate	Hyman Mercantile Co., Summit
1052	Stern's Am. R. B. Superphosphate	W. J Davis, Terry
1075	Stern's Am. R. B. Superphosphate	McLeod & Co., Purvis
		Average
		Guarantee
	TENNESSEE CHEMICAL COMPAAY, Nashville, Tenn.	
1084	Ox Bone with Am. and Potash	Myers & Egger, Columbus
1116	Ox Bone with Am. and Potash	R. M. Bourdeaux & Co., Lauderdale
		Average
		Gauarntee

Labratory Number.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative value per ton.
		Water-soluble.	Citrate-soluble.	Insoluble.	Total.			
1034	5.36	.....	.....	.....	17.09	2.86	.....	15.70
1139	4.90	.....	.....	.....	17.86	3.05	.....	16.55
1109	6.40	.....	.....	.....	16.54	2.82	.....	15.32
1214	4.94	.....	.....	.....	17.08	2.73	.....	15.37
.....	**5.40**	.....	.....	.....	**17.14**	**2.87**	.....	**15.74**
.....	.....	.....	.....	.....	*18.50*	*2.50*	.....	*15.50*
1215	4.32	.....	.....	.....	.....	.....	12.52	12.52
1035	4.38	.....	.....	.....	.....	.....	12.42	12.42
.....	**4.35**	.....	.....	.....	.....	.....	**12.47**	**12.47**
.....	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
994	12.17	8.15	2.74	1.56	12.45	2.14	2.72	18.69
1123	10.27	7.60	3.82	1.33	12.75	2.20	2.90	19.44
1216	10.04	6.93	3.79	.42	11.14	2.34	3.30	19.49
.....	**10.83**	**7.56**	**3.45**	**1.10**	**12.11**	**2.23**	**2.97**	**19.21**
.....	.....	*4.00*	*5.00*	.....	.....	*1.65*	*2.00*	*14.62*
1140	16.57	6.20	1.58	1.54	9.32	1.93	1.61	14.06
1160	14.57	5.94	2.89	1.05	9.88	1.87	1.86	15.08
.....	**15.57**	**6.07**	**2.24**	**1.30**	**9.60**	**1.90**	**1.73**	**14.57**
.....	.....	*4.00*	*4.00*	*1.00*	*9.00*	*1.65*	*1.50*	*13.23*
1159	14.62	6.15	3.01	1.10	10.26	2.02	1.56	15.47
.....	.....	*4.00*	*4.00*	*1.00*	*9.00*	*1.65*	*1.50*	*13.23*
995	11.74	6.41	3.30	1.00	10.71	1.70	1.74	15.47
996	11.55	7.02	2.63	1.23	10 88	1.73	1.82	15.53
1052	15.37	6.33	1.56	1.24	9.13	1.68	1.57	13.50
1075	19.02	6.18	2.48	.82	9.48	1.89	1.68	14.82
.....	**14.42**	**6.49**	**2.49**	**1.07**	**10.05**	**1.75**	**1.70**	**14.82**
.....	.....	*4.00*	*4.00*	*1.00*	*9.00*	*1.65*	*1.50*	*13.23*
1084	9.66	7.27	4.00	.82	12.09	.83	1 19	14.15
1116	6.31	7.98	3.95	.99	12.92	1.10	1.09	15.37
.....	**7.98**	**7.63**	**3.98**	**.91**	**12.50**	**.96**	**1.14**	**14 76**
.....	.....	*6.00*	*4.00*	*1.00*	*11.00*	*.85*	*1.00*	*12.73*

Labratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
1110	Ox Bone and Potash.....	W. B. Potts Co., Kosciusko.....
		Guarantee ....
1085	Ox Cotton Guano.....	Myers & Egger, Columbus.....
1086	Ox Cotton Guano.... ...	Myers & Egger, Steenston.....
1188	Ox Cotton Guano.....	J. C. Stanley & Co., Booneville.....
		Average..... .....
		Guarantee .....
1087	Ox High Grade Dissolved Bone.....	Myers & Egger, Columbus.....
1088	Ox High Grade Dissolved Bone.....	Myers & Egger, Steenston.....
1141	Ox High Grade Dissolved Bone.....	H. B. Lewis, Columbia.....
		Average..... .....
		Guarantee ....
998	Threefoot's H. G. English Acid Phosphate.....	Threefoot Bros. & Co., Meridian....
1125	Threefoot's H. G. English Acid Phosphate.... ..	J. D. Clark, Lauderdale.....
1217	Threefoot's H. G. English Acid Phosphate.....	E. P. & B. R. Brown, Lockhart....
		Average..... .....
		Guarantee ....
999	Threefoot's Imp. Mixture.	Threefoot Bros. & Co., Meridian....
1124	Threefoot's Imp. Mixture.	Hand Bros., Quitman.....
1218	Threefoot's Imp. Mixture.	J. D. Bryan, Nettleton..... .....
		Average..... .....
		Guarantee ....

Laboratory Number.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative value per ton
		Water-soluble.	Citrate-soluble.	Insoluble.	Total.			
1110	11.14	9.81	4.32	.42	14.55	.....	1.26	14.96
.....	.....	*7.00*	*5.00*	*1.00*	*13.00*	.....	*1.00*	*12.50*
1085	9.36	8.69	3.73	1.18	13.60	1.35	1.20	16.62
1086	9.93	8.60	3.62	1.36	13.58	1.29	1.18	16.26
1188	12.24	8 74	3.01	1.15	12.90	1.65	1.35	16.92
.....	**10.51**	**8.68**	**3.45**	**1.23**	**13.36**	**1.43**	**1.24**	**16.60**
.....	.....	*6.00*	*4.00*	*1.00*	*11.00*	*1.65*	*1.00*	*14.73*
1087	10.37	11.55	3.22	.35	15.12	.....	.....	12.97
1088	12.78	12.58	2.49	.41	15.48	.....	.....	13.31
1141	11.00	10 45	4.51	.69	15.65	.....	.....	13.01
.....	**11.38**	**11.53**	**3.41**	**.48**	**15 41**	.....	.....	**13.10**
.....	.....	*8.00*	*6.00*	*1.00*	*15.00*	.....	.....	*12.00*
998	16 46	13.05	3.18	.91	17.14	.....	.....	14.29
1125	11.97	9.80	7.35	.88	18.03	.....	.....	14.70
1217	11.70	10.35	7.37	1.04	17.72	.....	.....	15 21
.....	**16.71**	**11 07**	**5.97**	**.94**	**17.63**	.....	.....	**14.73**
.....	.....	*13.00*	*2.00*	.....	.....	.....	.....	*13.30*
999	12.91	8.35	2.60	.84	11.79	1.74	2.36	17.40
1124	10.19	7.32	2.53	1.66	11.51	2.00	2 29	16.89
1218	10.78	8.23	2.54	1.29	12.06	1.76	1.94	16.86
.....	**11.29**	**7.97**	**3.46**	**1.26**	**11.78**	**1.83**	**2.19**	**17.05**
.....	.....	*8.00*	*2.00*	*1.00*	*11.00*	*1.75*	*2.00*	*16.18*

ANALYSES

—OF—

FERTILIZERS

ON SALE IN MISSISSIPPI.

FIFTH MONTHLY EDITION,

INCLUDING

ALL ANALYSES FOR SEASON 1898-'99.

These bulletins will be sent free to any address upon application to State Chemist.

MISSISSIPPI AGRICULTURAL
EXPERIMENT STATION.

BULLETIN NO. 60. SEPTEMBER, 1899.

VALUE OF COTTON SEED TO THE FARMER.

Introduction.—The results of feeding tests with cotton seed, cottonseed meal and corn, which are given in this bulletin, are worthy of careful study by the farmers of this state. The facts, as demonstrated, are: (1) a pound of cotton seed has a greater value for feeding cattle than a pound of corn; (2) a pound of cottonseed meal has a feeding value about equal to two pounds of corn; (3) that at least 85 per cent of the fertilizing ingredients in the feeds is excreted by the animals fed, and may be recovered in the manure; (4) that nearly half of the fertilizing ingredients excreted is found in the urine; (5) that both cotton seed and cottonseed meal may constitute a very important part of the grain feed of cattle without injury to their health; (6) that cotton seed and cottonseed meal, when fed to dairy cows in proper quantity and properly combined with other feeds, do not injure the quality of either milk or butter.

Value of a ton of cotton seed.—With corn at 40 cents per bushel (about the average price in this state) a ton of cotton seed is worth $16 70 as a feed, for either beef cattle or dairy cattle. At present prices for commercial fertilizers nitrogen costs about twelve cents per pound, and phosphoric acid and potash each five cents per pound. Allowing these prices for the same ingredients in manure, we have $9.09 as the fertilizing

value of the manure for each ton of seed fed, making for a farmer a total value per ton of $25.79. Farmers sell their seed for four to six dollars per ton! Some of them sell for two dollars per ton!!

Value of a ton of cottonseed meal.—In a similar way we find the feeding value of a ton of cottonseed meal to be $28.56, and the manure to be worth $19.13 for every ton of meal consumed, making a total value of $47.69 that a farmer might derive per ton by first feeding the meal to cattle and applying the manure to his land.

Value of the cotton seed crop.—Mississippi produced, in '97-98, 1,627,000 bales of cotton. This gave 800,000 tons of seed which had a combined feeding and manurial value of $20,632,000. Had the entire crop been sold for $5.00 per ton, it would have brought only $4,000,000.

The cotton crop for the South the same year was 11,200,000 bales and 5,600,000 tons of seed, having a combined feeding and fertilizing value of $144,424,000. At $5.00 per ton the seed would have brought $28,000,000. The farmers of Mississippi lost $16,632,000 on this one crop, and the farmers of the entire cotton belt lost $116,424,000!!

Small oil mills.—The present disposition of the cotton seed crop secures to the farmer a very small part of its real value, and must of necessity give place to a practice that will secure to the farmer the maximum benefit which he may derive from this product.

The time will come when the Southern farmer will realize that the fertilizing value in cotton seed must stay on the farm to maintain its fertility and productiveness.

He will not always regard the matter of **hauling** as of no consequence—as something which he can do without cost. If the best disposition of cotton seed is finally demonstrated to be to extract the oil for human food and other commercial purposes, and let the meal and hulls go back

to the farms to serve both as feed and fertilizer, then, most likely, there will be a small oil mill at each ginnery and oil and lint will be the only products of the cotton crop sent to market.

The Southern farmer, however, need not wait for oil mills. He may get the full value of his cotton seed by a judicious system of feeding, accompanied by the most careful saving and proper use of the manure.

Respectfully,
W. L. HUTCHINSON,
Director.

FEEDING COTTON SEED, COTTONSEED MEAL AND CORN TO DAIRY COWS.

J. S. MOORE.

Until a comparatively recent time the value of the cotton crop depended almost entirely on the amount received for the lint. Since the fall in prices of this staple crop, however, it has become necessary to utilize the seed in order to make the cotton crop a paying one. There is no doubt but that cotton seed and its products, with corn, must constitute the chief part of grain rations for dairy cows in this state. To feed intelligently, the farmer must have a correct idea of the comparative values of these products.

This station has been feeding different amounts of these feeds during the past two winters to dairy cows, and in the following pages is given the work done and the conclusions reached concerning the relative values of cotton seed, cottonseed meal, and corn and cob meal. A number of trials at other stations indicate that one pound of corn and cob meal is practically equal to one pound of corn meal. The corn and cob meal, being the cheaper of the two, was used in all the following experiments.

Plan of the experiments.—Before a trial was commenced with any two feeds, the cows were weighed for three consecutive days, and the average taken as their true weight. Two lots of four cows each were then put in an experiment. The only difference in the feeds of these two lots was in the ones compared; i. e., in Experiment I, under the heading, "Cottonseed meal compared with cotton seed," the only difference in the rations fed was that lot 1 received three pounds of the

meal, and lot 2 six pounds of the seed ; the hay, silage, and wheat bran being the same for each lot.

Each experiment lasted four weeks. At the end of this time the cows were again weighed for three consecutive days and the average taken as their true weight at the close of the trial.

Cottonseed meal compared with cotton seed.—Three experiments have been made with these feeds, using different proportions of the meal and seed.

EXPERIMENT I.

DAILY RATION FOR EACH COW	YIELD OF MILK.				
	1ST. WEEK	2ND. WEEK	3RD. WEEK	4TH. WEEK	TOTAL.
LOT 1					
Peavine hay, 5 lbs. Silage, 20 lbs. Wheat bran, 4 lbs. Cottonseed meal, 3 lbs.	lbs. 323	lbs. 303	lbs. 304	lbs. 307	lbs. 1237
LOT 2					
Peavine hay, 5 lbs. Silage, 20 lbs. Wheat bran, 4 lbs. Cotton seed, 6 lbs.	lbs. 324	lbs. 338	lbs. 344	lbs. 328	lbs. 1334

Average weight of four cows in **Lot 1** at begin'g, 649 lbs.
" " " at close, 629 "
" " **Lot 2** at begin'g, 660 "
" " " at close, 672 "

Results.—The cows getting six pounds of seed gave a better yield of milk than the ones receiving three pounds of meal. The cows in lot 1 also lost 20 pounds each in weight, while those in lot 2 gained 12 pounds each.

EXPERIMENT II.

LOT 1

DAILY RATION FOR EACH COW	YIELD OF MILK				
	1ST. WEEK	2ND. WEEK	3RD. WEEK	4TH. WEEK	TOTAL.
Peavine hay, 5 lbs.					
Silage, 20 lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Wheat bran, 4 lbs.	348	354	355	346	1403
Cottonseed meal, 3½ lbs.					

LOT 2

Peavine hay, 5 lbs.					
Silage, 20 lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Wheat bran, 4 lbs.	357	350	354	334	1395
Cotton seed, 6 lbs.					

Average weight of four cows in **Lot 1** at begin'g, 659 lbs.
" " " at close, 673 lbs.
" " **Lot 2** at begin'g, 688 lbs.
" " " at close, 659 lbs.

Results.—This trial indicates that 3½ pounds of cottonseed meal are about equal to six pounds of seed. The meal had a tendency to fatten the cows, as they gained 14 pounds each, while the lot getting the seed lost 29 pounds each.

EXPERIMENT III.

DAILY RATION FOR EACH COW	YIELD OF MILK				
	1ST. WEEK	2ND. WEEK	3RD. WEEK	4TH. WEEK	TOTAL.
LOT 1					
Peavine hay, 10 lbs. Silage, 15 lbs. Wheat bran, 2 lbs. Corn and cob meal, 6 lbs. Cotton seed, 6 lbs.	lbs. 337	lbs. 322	lbs. 320	lbs. 323	lbs. 1302
LOT 2					
Peavine hay, 10 lbs. Silage, 15 lbs. Wheat bran, 2 lbs. Corn and cob meal, 6 lbs. Cottonseed meal, 4 lbs.	lbs. 360	lbs. 393	lbs. 406	lbs 427	lbs. 1586

Results.—In this experiment the weight of the cows was not considered. The ration containing the four pounds of meal gave decidedly a better flow of milk than the lot that was fed six pounds of seed.

Results of the three experiments.—The following conclusions may be drawn concerning the rations fed:

1. Six pounds of cotton seed are superior to three pounds of cottonseed meal.

2. Six pounds of cotton seed are not equal to four pounds of cottonseed meal.

3. Six pounds of cotton seed are about equal to 3½ pounds of cottonseed meal.

4. One pound of cottonseed meal would therefore be equal to 1.71 pounds of cotton seed.

Cotton seed compared with corn and cob meal (or corn meal.)--The following work was done during the winter of 1898-99 for the purpose of determining the relative values of these two feeds for dairy cows.

EXPERIMENT I.

DAILY RATION FOR EACH COW	YIELD OF MILK				
	1ST. WEEK	2ND. WEEK	3RD. WEEK	4TH. WEEK	TOTAL
LOT 1					
Peavine hay, 5 lbs. Silage, 20 lbs. Wheat bran, 4 lbs. Corn and cob meal, 6 lbs.	lbs. 329	lbs. 311	lbs. 313	lbs. 318	lbs. 1271
LOT 2					
Peavine hay, 5 lbs. Silage, 20 lbs. Wheat bran, 4 lbs. Cotton seed, 6 lbs.	lbs. 324	lbs. 337	lbs. 344	lbs. 328	lbs. 1333

Average weight of four cows in **Lot 1** at begin'g, 675 lbs.
" " " at close, 660 "
" " **Lot 2** at begin'g, 660 "
" " " at close, 672 "

Results.--At the close of the third week it was evident that the six pounds of corn and cob meal was not giving as good results as the six pounds of seed. The meal was therefore increased to eight pounds, but with this extra feed the total amount of milk for the four weeks from this lot was less than from the one receiving the six pounds of seed. The cows in neither lot increased materially in weight.

EXPERIMENT II.

DAILY RATION FOR EACH COW	YIELD OF MILK				
	1ST. WEEK	2ND. WEEK	3RD. WEEK	4TH. WEEK	TOTAL
LOT 1					
Peavine hay, 5 lbs. Silage, 20 lbs. Wheat bran, 4 lbs. Corn and cob meal, 8 lbs.	lbs. 324	lbs. 312	lbs. 308	lbs. 297	lbs. 1241
LOT 2					
Peavine hay, 5 lbs. Silage, 20 lbs. Wheat bran, 4 lbs. Cotton seed, 6 lbs.	lbs. 324	lbs. 337	lbs. 344	lbs. 328	lbs. 1333

Average weight of four cows in **Lot 1** at begin'g, 629 lbs.
" " " at close, 676 "
" " **Lot 2** at begin'g, 660 "
" " " at close, 678 "

Results.—By comparing this table with the preceding one, it will be noticed that the cows getting the eight pounds of corn and cob meal gave for the first week 324 pounds of milk, while those fed six pounds of this meal gave 329 pounds of milk for the same time. The total yield for the four weeks from the lot getting the larger quantity of meal is 1241 pounds against 1271 pounds of milk from the lot receiving only six pounds.

This experiment would indicate, (1) that the cows used were unable to convert the extra amount of meal into milk, and, (2) that the six pounds of seed gave better results than the eight pounds of corn and cob meal. The ration containing the meal is not a well-balanced one for dairy cows, and the cows receiving this feed increased very materially in weight, showing that some of the food was converted into fat instead of milk.

Results of the two experiments.

1. The lot receiving the six pounds of cotton seed gave a better yield of milk than the one getting six pounds of corn and cob meal.

2. The lot fed six pounds of cotton seed gave better results than the one fed eight pounds of corn and cob meal.

3. The six pounds of corn and cob meal gave as good results as did eight pounds of the same meal.

4. In a well-balanced ration, one pound of cotton seed is better than one pound of corn and cob meal.

Cottonseed meal compared with corn and cob meal.—The relative values of cotton seed and cottonseed meal, and also that of corn and cob meal and cotton seed having been given, the comparative values of cotton seed meal and corn and cob meal will be reported below.

EXPERIMENT I.

DAILY RATION FOR EACH COW	YIELD OF MILK				
	1ST. WEEK	2ND. WEEK	3RD. WEEK	4TH. WEEK	TOTAL
LOT 1					
Peavine hay, 5 lbs. Silage, 20 lbs. Wheat bran, 4 lbs. Cottonseed meal, 3 lbs.	lbs. 323	lbs. 303	lbs. 304	lbs. 307	lbs. 1237
LOT 2					
Peavine hay, 5 lbs. Silage, 20 lbs. Wheat bran, 4 lbs. Corn and cob meal, 6 lbs.	lbs. 329	lbs. 311	lbs. 313	lbs. 318	lbs. 1271

Average weight of four cows in **Lot 1** at begin'g, 649 lbs.
" " " at close, 629 "
" " **Lot 2** at begin'g, 675 "
" " " at close, 660 "

Results.—The lot fed on the ration containing the six pounds of corn and cob meal gave for the first week six pounds more milk, and for the four weeks 34 pounds more milk than the one fed on the cottonseed meal ration, while the loss in weight was slightly more in lot 1 than in lot 2. These two rations appear to be about equal.

EXPERIMENT II.

DAILY RATION FOR EACH COW	YIELD OF MILK				
	1ST. WEEK	2ND. WEEK	3RD. WEEK	4TH. WEEK	TOTAL
LOT 1					
Peavine hay, 5 lbs. Silage, 20 lbs. Wheat bran, 4 lbs. Cottonseed meal, 3 lbs.	lbs. 323	lbs. 303	lbs. 304	lbs. 307	lbs. 1237
LOT 2					
Peavine hay, 5 lbs. Silage, 20 lbs. Wheat bran, 4 lbs. Corn and cob meal, 8 lbs.	lbs. 323	lbs. 312	lbs. 308	lbs. 298	lbs. 1241

Average weight of four cows in **Lot 1** at begin'g, 649 lbs.
" " " " at close, 629 "
" " **Lot 2** at begin'g, 629 "
" " " at close, 676 "

Results.—Here, as in a former experiment, the ration containing eight pounds of corn and cob meal gave no better results than did the six pounds. Three pounds of cottonseed meal are about equal to eight pounds of corn and cob meal for milk, when fed as in the above rations. Lot 1 lost in the four weeks an average of 20 pounds each, while lot 2 gained in the same time an average of 47 pounds each. In experiment I the lot receiving only six pounds of corn and cob meal lost 15 pounds each.

This indicates that the cows, when fed as much as eight pounds of the meal, did not convert it into milk, but were gaining in flesh at the rate of about 1.7 pounds a day.

EXPERIMENT III.

LOT 1

DAILY RATION FOR EACH COW	YIELD OF MILK				
	1ST. WEEK	2ND. WEEK	3RD. WEEK	4TH. WEEK	TOTAL
Peavine hay, 5 lbs.					
Silage, 20 lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Wheat bran, 4 lbs.	347	354	355	346	1402
Cottonseed meal, 3½ lbs.					

LOT 2

Peavine hay, 5 lbs.					
Si age, 20 lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Wheat bran, 4 lbs.	323	312	308	298	1241
Corn and cob meal, 8 lbs.					

Average weight of four cows in **Lot 1** at begin'g, 659 lbs.
" " " at close, 673 "
" " **Lot 2** at begin'g, 629 "
" " " at close, 676 "

Results.—The lot fed on the ration containing the corn and cob meal steadily decreased in the flow of milk, while the lot receiving the cottonseed meal increased, with the exception of the last week, when the yield was a few pounds less than that of the previous week.

Both lots increased in weight, but the one getting the cottonseed meal gained only 14 pounds each, while the one fed corn and cob meal gained 47 pounds each.

Results of the three experiments.

The rations fed indicate that :

1. Three pounds of cottonseed meal are about equal to six pounds of corn and cob meal.

2. Three pounds of cottonseed meal gave as satisfactory yields of milk as eight pounds of corn and cob meal, but the latter caused the cows to fatten.

3. Three and one-half pounds of cottonseed meal are better than either six or eight pounds of corn and cob meal in the dairy rations used.

4. In a well-balanced dairy ration two pounds of corn and cob meal are about equal to one pound of cottonseed meal.

Summary.—The work done with these feeds indicate that their relative values are as follows:

1. One pound of cotton seed is equal to 1.17 pounds of corn and cob meal (corn meal), or to .58 pounds of cottonseed meal.

2. One pound of cottonseed meal is equal to 1.71 pounds of cotton seed, or two pounds of corn and cob meal.

3. One pound of corn and cob meal is equal to .50 pounds of cottonseed meal, or .85 pounds of cotton seed.

According to these results, if corn is worth 40 cents per bushel, or $14.28 a ton, cotton seed should be worth 27.8 cents a bushel, or $16.70 a ton, and cottonseed meal $28.56 a ton; if cotton seed are worth 10 cents a bushel, or $6.00 a ton, corn should be worth 9.1 cents a bushel, or $5.10 a ton, and cottonseed meal should be worth $10.26 a ton; if cottonseed meal is worth $16.00 a ton, cotton seed should be worth 12.1 cents a bushel, or $9.28 a ton and corn should be worth 14.3 cents a bushel or $8.00 a ton.

INFLUENCE OF THE FEED ON THE QUALITY OF MILK AND BUTTER.

J. S. MOORE.

Per cent of fat in milk.—The opinion held by many that the food eaten influences the per cent of fat in the milk is now regarded as erroneous by most scientific men. A large number of experiments have been conducted by the experiment stations throughout the country with the almost invariable result that there is no **permanent** change produced by the feed. It is possible to vary the percentage for a short period, but this is more probably brought about by **nervous** influences than by the character of the food.

During the feeding trials reported in this bulletin a sample of milk was taken from each cow about twice a week and the per cent of fat determined by the Babcock tester, and there was no permanent change due to the feed. There was, of course, a large difference due to the individual animal. Often a very decided variation would follow a sudden change of feed, but the cow would soon begin to give the normal amount again.

Effect of the feed on the composition of the butter fat.—That the feed influences in some way the character of the fat in milk is now generally accepted as true, but there is a lack of agreement among scientific men as to just what effect a certain food has on this fat.

The average melting point of butter made from cows fed five pounds of cottonseed meal a day, as determined by several tests made by this station is 100.1 degrees F., while that from cows fed corn meal and wheat bran as a grain ration is 96.8 degrees F. The butter from the cottonseed meal or cotton seed is therefore firmer and

will stand shipment better during the summer months than will that made from cows receiving no cotton seed or meal. No deleterious effect on the composition of the butter fat has been detected when the cows were getting as much as five pounds of the meal or six pounds of seed.

Quality of the butter.—The statement is often made that a good quality of butter cannot be produced from cows receiving a ration consisting largely of cotton seed or cottonseed meal. In order to determine whether or not this is true, the entire station herd was fed for two weeks on the following ration:

DAILY RATION FOR EACH COW.

Peavine hay	10 pounds.
Corn Silage	20 "
Wheat bran	4 "
Cottonseed meal	5 "

The milk from this herd for the last two days was separated, the cream properly ripened, and the butter made from this cream, as well as the two following lots, was sent to M. M. McKeen & Co., St. Louis, Mo., to be scored.

At the end of two weeks six pounds of cotton seed were substituted for the meal, the rest of the ration remaining the same. The cows were fed two weeks on this and the milk of the last two days was treated in the same way as the first.

A third ration in which six pounds of corn and cob meal, instead of the cottonseed meal, was next fed to the herd for two weeks, and the milk of the last two days treated like that of the preceding lots. Below is given a table showing the score of the three lots of butter, and also a column showing the score of perfect butter.

SCORE OF BUTTER

	PERFECT SCORE	SCORE OF BUTTER FROM HERD RECEIVING COTTONSEED MEAL	SCORE OF BUTTER FROM HERD RECEIVING COTTON SEED	SCORE OF BUTTER FROM HERD RECEIVING CORN AND COB MEAL
Flavor	45	43½	43	43
Texture	30	28	28	28
Color	10	10	10	10
Salt	10	9	10	10
Packing	5	5	5	5
Total	100	95½	96	96

Results.—The third ration fed ; that is, peavine hay, silage, wheat bran, and corn and cob meal is considered a good one by most dairymen for producing butter of an excellent quality and it was included in this trial in order to compare the quality of the product from this lot with those in which cotton seed or cottonseed meal constituted the principal part of the grain fed.

The butter made from the herd when it was getting cotton seed scored 96 points out of a possible hundred, which was the same score as that made by the butter from the herd getting corn and cob meal. The score of the butter made from the herd getting cottonseed meal was 95½ points. There is such a slight difference between the scores that the quality is practically the same for the different feeds. The quality of the butter was not injured by feeding as much as five pounds of cottonseed meal or six pounds of seed.

FEEDING COTTON SEED, COTTONSEED MEAL AND CORN TO BEEF STEERS.

E. R. LLOYD.

Kind of animals.---In this experiment six calves, nine months old, were used. The calves had run with their dams until eight months old. They were then separated and put on a ration of cottonseed meal and hulls for one month. December 5, 1898, the calves were divided into three lots of two animals each.

The division into lots was made with a view of having each set correspond as nearly as possible in weight and age.

Feeding periods.---The experiment was in progress 120 days, which time was divided into four periods of 30 days each.

Weighings---Weighings were made of each individual animal during three successive days, at the beginning and at the end of each period. The average of the first three weighings was taken as the beginning weights and the average of the last three as the closing weights of each period. Throughout the experiment the animals were fed night and morning, and allowed no water for twelve hours previous to weighing. This method was found most satisfactory, and there was very slight variations in any animal during the three weighings.

Outline of experiment.---The foods used were cottonseed meal, cotton seed, corn and cob meal, wheat bran, Johnson grass and alfalfa hays.

Lot 1 was fed corn and cob meal, wheat bran and Johnson grass hay during the first period. In the second period an equal weight of corn and cob meal was substi-

tuted for the wheat bran, the hay remaining the same. In the third period no change was made in the ration. In the fourth period the grain food remained the same, but alfalfa was substituted for Johnson grass hay.

Lot 2 was fed cotton seed meal, wheat bran and Johnson grass hay during the first period. In the second period an equal weight of corn and cob meal was substituted for the wheat bran. The hay remained the same. In the third period no change was made in the ration, except to increase the cottonseed meal one pound. In the fourth period the grain food remained the same, but alfalfa was substituted for Johnson grass hay.

Lot 3 was fed cotton seed, wheat bran, and Johnson grass hay during the first period. In the second period an equal weight of corn and cob meal was substituted for the wheat bran. The hay remained the same. In the third period no change was made in the ration. In the fourth period the grain food remained the same, but alfalfa was substituted for Johnson grass hay.

The figures below represent the actual amounts of food consumed by each lot during the first period of 30 days:

Lot 1.

Amount food consumed { Johnson grass hay, 240 pounds; Corn and cob meal, 180 "; Wheat bran, 240 pounds

Weight at beginning	862 pounds
" close	947⅓ "
Gain	85⅓ "

Lot 2.

Amount food consumed { Johnson grass hay, 240 pounds; Cottonseed meal, 90 "; Wheat bran, 240 pounds

Weight at beginning	793⅓ pounds
" close	861⅓ "
Gain	68 "

Lot 3.

Amount food consumed { Johnson grass hay, 234 pounds
Cotton seed, 170 pounds
Wheat bran, 233 "

Weight at beginning..... ....850⅔ pounds
" close.....941⅓ "
Gain..... 90⅔ "

In the first period the grain foods had the following feeding value as compared to each other:

One pound cottonseed meal equals 1.50 lbs cotton seed
" " " " 1,60 ". corn
" cotton seed " 1.07 " corn

The figures below represent the actual amount of food consumed by each lot during the second period of 30 days:

Lot 1.

Amount food consumed { Johnson grass hay, 240 pounds
Corn and cob meal, 420 "

Weight at beginning.....947⅓ pounds
" close.....995⅓ "
Gain..... 48 "

Lot 2

Amount food consumed { Johnson grass hay, 240 pounds
Cottonseed meal, 90 "
Corn and cob meal, 240 "

Weight at beginning.....861⅓ pounds
" close.....896 "
Gain..... 34⅔ "

Lot 3.

Amount food consumed { Johnson grass hay, 239 pounds
Cotton seed, 178 pounds.
Corn and cob meal, 240 pounds

Weight at beginning.....941⅓ pounds
" close ..... .980 "
Gain..... 38⅔ "

In the second period the grain foods have the following feeding value as compared to each other:

One pound cottonseed meal equals 1.77 lbs. cotton seed
" " " " 1.44 " corn
" cotton seed " .80 " corn

The figures below represent the actual amount of food consumed by each lot during the third period of 30 days:

Lot 1.

Amount food consumed { Johnson grass hay, 240 pounds
Corn and cob meal, 420 "

Weight at beginning.....995½ pounds
" close.....1024 "
Gain ..... 28⅔ "

Lot 2.

Amount food consumed { Johnson grass hay, 240 pounds
Cottonseed meal, 120 "
Corn and cob meal, 240 "

Weight at beginning.....896 pounds
" close.....948 "
Gain..... 52 "

Lot 3.

Amount food consumed { Johnson grass hay, 240 pounds
Cotton seed, 180 pounds
Corn and cob meal, 240 pounds

Weight at beginning..... 980 pounds
" close..... 1031⅓ "
Gain..... 51⅓ "

In the third period the grain foods had the following feeding values as compared to each other:

One pound cottonseed meal equals 1.52 lbs. cotton seed
" " " 2.73 " corn
" cotton seed " 1.79 " corn

The average of the three feeding periods shows the grain foods to have the following values as compared to each other:

One pound cottonseed meal equals 1.60 lbs. cotton seed
" " " 1.92 " corn
" Cotton seed " 1.22 " corn

The fourth period will be considered separately from the first three, since the ration was changed, and a leguminous hay substituted for a grass hay.

The figures below represent the actual amount of food consumed by each lot in the fourth period of 30 days:

Lot 1

Amount food consumed { Alfalfa hay, 240 pounds; Corn and cob meal, 420 pounds

Weight at beginning.....1042 pounds
" close.....1086⅔ "
Gain..... 44⅔ "

Lot 2.

Amount food consumed { Alfalfa hay, 240 pounds; Cottonseed meal, 120 pounds; Corn and cob meal, 240 "

Weight at beginning.....954⅓ pounds
" close.....982 "
Gain..... 27⅔ "

Lot 3.

Amount food consumed { Alfalfa hay, 240 pounds; Cotton seed, 180 "; Corn and cob meal, 240 pounds

Weight at beginning.....1049⅔ pounds
" close.....1040 "
Loss..... 9⅔ "

It will be noticed during this period that the first two lots made a fair gain, while lot 3 lost 9⅔ pounds.

The first lot made the best gain, which indicates that the alfalfa hay made a better balanced ration with the corn and cob meal than did the grass hay. The second lot made only a little more than half as much gain with the leguminous hay as with the grass

hay, indicating that the ration was not prorerly balanced.

The third lot lost 9⅔ pounds. This loss is accounted for mainly by the condition of one of the steers; while the steer ate his food, his hair and general appearance showed that he was not making good use of his food.

COST OF WINTERING THE BEEF HERD.

E. R. LLOYD.

As a rule, we do not begin to feed our breeding cattle before the first or middle of December.

After the corn has been gathered the cattle, generally, have the run of the stalk fields from the middle of October to the first of December. Last fall, on account of the killing frost the last of October, (nearly a month earlier than we usually have a killing frost,) and the heavy and continued rainfall during the fall and entire winter, the cattle could not be put in the stalk fields, so the feeding had to begin earlier than usual.

The regular feeding began Nov. 1st.

The cattle had been de-horned, and had the run of a 50 acre pasture, but after Nov. 1st. there was very little for the cattle to get in the pasture.

The feeding was done in a barn 24x60 ft. A feed trough, 4 ft. wide, with hay rack above, ran through center, with gate at each end, so the cattle could be divided, half put on each side of trough, and in this way the tendency to crowd was lessened. The herd was composed of 25 cows and 1 bull.

As the cows dropped calves, it was thought best to separate them from the herd, and give a more liberal feed, so the figures below are based upon the number of cows kept at feeding barn regularly during the winter.

The cattle were fed once each day, and the time of one man, one hour each day was required to feed and put the cattle in the barn.

Each cow received a daily ration of cottonseed meal 3¾ lbs., cottonseed hulls 9¾ lbs.

The cattle were fed from Nov. 1st 1898 to Mch. 15th 1899, and during that time ate

Cottonseed meal,	12,400 lbs.	@	77½c. per 100,	—$96.10
Cottonseed hulls,	31,882 lbs.	@	15c. per 100,	— 47.82
Mixed hay,	3,000 lbs.	@	30c. per 100,	— 9.00
Labor,	135 hours	@	6c. per hour,	— 8.10
Total cost of feed and labor for 135 days,				$161.02

Calculations made from the number of cows fed, and the cost of feed and labor, show that the daily cost of food and labor per cow, for the 135 days, was 4.9 cents, or a cost of $1.47 per month per cow.

The cattle were weighed three times during the winter, each animal being weighed separately, to see if they were getting sufficient food to maintain them.

The first weighing was done Jan. 10th, 1899. The 26 cows made a total weight of 17,934 lbs., or an average of 689.7 lbs. The second weighing was made Feb. 10th, 1899 ; the 26 cows weighed 18,048 lbs., or an average of 693.8 lbs., giving each cow a gain of 4.1 lbs. in 30 days.

Two of the cows, included in the second weighing, had dropped calves in Oct. and Jan., and had gotten low in flesh from suckling their calves. These cows had lost 106 lbs. and 110 lbs. Now, if we leave these two cows out, the herd made an average gain of 12.7 lbs. in 30 days.

The last weighing was done Mch. 17th, 1899, and only 24 cows were included in this weighing, two had just dropped calves, and were not weighed.

The 24 cows weighed 16,292 lbs., making an average of 678.8 lbs., giving an average gain of 2 lbs. per cow in 37 days.

It will seem strange to some that, while the average weight of the cows at the last weighing was less than in the two previous weighings, they still made a gain of 2 lbs. per cow in 37 days.

This difference is explained by the weight of the two

cows left out. They were the largest in the herd, weighing 990 lbs. and 816 lbs. While leaving out the the two large cows would necessarily lower the average of the herd it would not affect the gain.

From the report of the chemist, (which will be found in another part of this bulletin), I get the data from which the fertilizer value of the excrement is computed. The chemist found that 85 per cent of the fertilizer value of the foods was recovered through the excrement.

Cost of feed.

During the 135 days the cattle ate,		
Cottonseed meal,	12,400 lbs. @ 77½c. per 100,—	$ 96.10
Cottonseed hulls,	31,882 lbs. @ 15c. per 100,—	47.82
Mixed hay,	3,000 lbs. @ 30c. per 100,—	9.00
Total cost of feed,		$152.92

Fertilizer value of feed.

Cottonseed meal,	12,400 lbs.	$136.40
Cottonseed hulls,	31,882 lbs.	63.44
Mixed hay,	3,000 lbs.	6.36
Total fertilizer value of feed,		$206.20

While the total fertilizer value of feed is $206.20, the chemist found that 85 per cent of this was recovered through the excrement, which will make the manure worth $175.27.

We think that a safe estimate of the amount of the manure, which was dropped on pasture, where it was beneficial to the grasses, would be 50 per cent, and from this estimate we get the following result:

Cost of feed	$152.92
Labor	8.10
Total cost	$161.02
Fertilizer value of feed (one-half)	$ 87.63
Cost of wintering cattle	$ 73.39

FEEDING COTTON SEED TO HOGS.

E. R. LLOYD.

In 1897 some experiments were made in feeding cotton seed and cottonseed meal, both raw and cooked, to hogs and pigs. The feeding trial with grown hogs extended over a period of twelve weeks. Eight Berkshire hogs were selected and divided into four lots of two hogs each.

Lot 1 received cooked cottonseed meal and corn meal.

Lot 2 received raw cottonseed meal and corn meal.

Lot 3 received cooked cotton seed and corn meal.

Lot 4 received cooked cottonseed meal and whole corn.

All four lots made their largest gain the second week of the trial. Taking the experiment as a whole, the gain made by the lots was neither satisfactory nor profitable. The hogs began to die first in the lot getting raw cottonseed meal. The first hog died at end of the fourth week, and at the end of the eigth week the remaining hog in same lot died. While the hogs getting the cooked seed and meal did not die, some were very sick and refused to eat, and would get better and begin eating again after being allowed to run in an oat and clover patch for several days. After the fourth week most of the hogs began to lose flesh, and after the sixth or eighth week none of lots made gains.

Twenty-three pigs four months old were selected and fed a ration of cooked cotton seed, corn meal, shorts and skim milk. They were fed forty-six days, and for the first two weeks made an average daily gain of one pound, but after the first two weeks the gain was small. The pigs continued to eat wtth great relish, leaving no waste. At the end of forty days the pigs began to die, and when the experiment closed four pigs had died and several

others were sick, but were turned into a clover lot, and were apparently well in a week. Some of these pigs were kept until grown, and put on feed to fatten for market. The cotton seed pigs were poor feeders and were never gotten in good condition.

We do not publish the results of these experiments in detail, for the reason that, until some method is devised by which the poisonous element in the feed can be cheaply and completely extracted, cotton seed and its products cannot be considered as a feed for hogs.

FERTILIZING CONSTITUENTS OF FEEDS RECOVERED IN THE MANURE.

W. R. PERKINS AND E. B. FERRIS.

In localities where it is customary to save all of the manure when feeding cattle, it is not uncommon that the greater part of the profit is derived from this source. Knowing that such a custom is rarely practiced by our feeders, and that farmers generally fail to give proper attention to the matter, it was deemed advisable to conduct an experiment with a view of learning what amount of fertilizing constituents in a feed could actually be recovered in the manure.

Plan of experiment.—The animals used in the work were the same steers that were being fed in the other experiments recorded in this bulletin. One steer from each lot was taken, and without changing the feed, the excrement, both solid and liquid, was collected for one week, weighed daily, and samples taken for analysis.

An attendant was kept constantly with the animals during the whole time of the experiment, and with the galvanized iron floor on which they stood and the rubber bags for catching the urine, no difficulty whatever was encountered in saving all excreted matter, both solid and liquid.

Data of experiment.—Following are the tables giving all data connected with the work:

TABLE I—ANALYSES OF FEEDS.

FEED	PER CENT. NITROGEN	PER CENT. POTASH.	PER CENT. PHOS. ACID
Johnson grass hay	.80	1.61	.63
Corn and cob meal	1.18	.42	.57
Cotton seed	3.24	1.17	1.36
Cottonseed meal	6.80	2.02	3.50

TABLE II—ANALYSES OF EXCREMENTS.

		PER CENT. NITROGEN.	PER CENT. POTASH.	PER CENT. PHOS. ACID.
Steer No. 1.	Dung (dry)	1.97	.58	.99
	Urine	.45	.99	.26
Steer No. 2.	Dung (dry)	2 82	1.08	2.52
	Urine	1.04	.87	.29
Steer No. 3.	Dung (Dry)	2.28	1.12	1.82
	Urine	.92	.97	.20

TABLE III—FERTILIZING CONSTITUENTS FED AND AMOUNT RECOVERED IN EXCREMENT.

	OZ.	DRY MATTER OZ.	CONTAINING		
			NITROGEN OZ.	POTASH OZ.	PHOS. ACID OZ.
STEER NO. 1.					
Johnson grass hay eaten	448	.....	3.584	7.213	2.822
Corn and cob meal eaten	784	.....	9.251	3.293	4.468
Total in feed.....	1232	.....	12 835	10.506	7.290
Excreted in dung	1569.04	396.8	7.817	2.301	3.928
Excreted in urine.....	780.00	.....	3.510	7.722	2.028
Total excreted.....	.....	.....	11.327	10.023	5.956
Per cent of fertilizing constituents of feed in excrement.....	.....	.....	88.2	95.6	82.
STEER NO. 2.					
Johnson gras shay eaten	448	.....	3.584	7.213	2.822
Corn and cob meal eaten	448	.....	5.286	1.881	2.553
Cottonseed meal eaten	224	.....	15.232	4.525	7.840
Total in feed.....	1120	.....	24.102	13.619	13.215
Excreted in dung.....	1483	345.7	9.748	3.733	8.711
Excreted in urine.....	983	.....	10.223	8.552	2.850
Total excreted.....	.....	.....	19.971	12.285	11.561
Per cent. excreted.....	.....	.....	82.8	90.2	87.5
STEER NO. 3.					
Johnson grass hay eaten	448	.....	3.584	7.213	2.822
Corn and cob meal eaten	448	.....	5.286	1.881	2.553
Cotton seed consumed..	336	.....	10 886	3.931	4.569
Total in feed.....	1232	.....	19.756	13.025	9.944
Excreted in dung.....	1732.0	405.4	9.243	4.540	7 378
Excreted in urine.....	764.5	.....	7.033	7 415	1.529
Total excreted.....	.....	.....	16.276	11.955	8.907
Per cent. excreted	.....	.....	82.3	91.8	89.7

Tables I. and II. are mere tabulations of analyses of feeds used and of the excrements collected in the experiment.

Table III. gives the amount and kind of food consumed, the excrement collected, and the amount of nitrogen, potash, and phosphoric acid contained in each, together with the percentage of fertilizing elements recovered in the manure. The average of these experiments gives about 85 per cent. of nitrogen, 92 per cent. of potash, and 86 per cent. of phosphoric acid recovered. It will be seen, also, that nearly half of the fertilizing constituents of the excrement is contained in the urine, and especially is this true when the feeds are rich in nitrogenous matter.

TABLE IV—COMPARATIVE VALUE OF FEEDS AND MANURE.*

	Steer 1.	Steer 2.	Steer 3.
Cost of feed used in experiment in cents	40.4	39.2	34.3
Manurial vafue of feeds in cents	15.59	27.21	22.61
Manurial value of excrement in cents	13.85	23.05	19.23
Per cent. of manurial value of feed recovered in excrement	88.8	84.7	85.0
Per cent. of fertilizing value excreted contained in dung	58.1	50.0	56.9
Per cent. of fertilizing value excreted contained in urine	41.9	50.	43.1

The fertilizing value of excrement depends largely upon the food consumed by the animal from which it is derived.

By comparing the value of the manures from the three steers in this experiment, they will be seen to increase in value along with the increase in fertilizing constituents of the feeds.

With such feeds as Johnson grass hay, and corn and cob meal, the value of the manure is small in comparison with the cost of the ration supplied to the animals; but when we come to consider the manure from cottonseed and cottonseed meal, its value approaches the original cost of the feed.

*All fertilizing values in this bulletin are calculated on the basis of 12½ cents per ℔ for nitrogen, and 5 cents per ℔ each for potash and phosphoric acid.

When cottonseed are selling for six dollars ($6.00) per ton, or 10 cents per bushel, and estimating that 85 per cent. of their fertilizing value, when fed, would be recovered in the manure, we obtain figures as follows:

Cost of 1 ton seed.....$6.00
Manuaial value of same.....10.70
Manurial value of excrement from 1 ton seed.. 9.09

Assuming that all of the manure could be saved, its fertilizing value would exceed the original cost of the seed by $3.09, or over 50 per cent., and be worth as a fertilizer just $1.63 less than the raw seed, reckoned on the same basis.

Manurial value of some common feeds.— Below we append a short table of the most common feeding stuffs, giving their selling price, their manurial value, and the value of the manure recoverable from them, assuming that 85 per cent. of their fertilizing value would be obtained in the manure as indicated by our experiment,

TABLE V—COST, MANURIAL VALUE, AND VALUE OF MANURE FROM SOME COMMON FEEDING STUFFS.

Feeding Stuff.	Cost Per Ton.	Manurial Value Per Ton.	Value of Manure From 1 Ton.
Corn..	$14.20	$5.65	$4.80
Corn & cob meal.	11.40	4.56	3.87
Cotton seed.....	6.00	10.70	9.09
Cottonseed meal	17.00	22.52	19.13
Cottonseed hulls	3.25	2.99	2.54
Wheat bran	18.00	11.17	9.49
Johns'n gr'ss hay	6.00	4.24	3 60

The one point emphasized in such a table is that cottonseed and its products, hulls and meal, especially the seed, at the customary prices, are the most remarkable feeding stuffs to be found anywhere. They may be fed to cattle recklessly, even wastefully, and if provision is made to save the waste and all of the excrement there will be more fertilizing value in the manure heap than the seed cost.

MISSISSIPPI

AGRICULTURAL EXPERIMENT STATION.

BULLETIN NO. 61.

ANALYSES

OF

COMMERCIAL FERTILIZERS ON SALE IN THE STATE.

AGRICULTURAL COLLEGE, MISS.
JANUARY 15TH, 1900.

THE MERIDIAN NEWS,
PRINTERS AND BINDERS,
MERIDIAN, MISS.

Mississippi Fertilizer Control.

Inspection and Analyses of Fertilizers

BY THE CHEMICAL DEPARTMENT OF THE

MISSISSIPPI AGRICULTURAL AND MECHANICAL COLLEGE.

W. F. HAND, State Chemist,
E. W. MAGRUDER, Assistant Chemist,
J. S. CARROLL, Ass't Chem't and Fertilizer Insp'r.
W. S. WELCH, Assistant Chemist.

This bulletin contains analyses of samples of the principal brands of fertilizers that have been placed on sale in this State so far this season. The samples were collected in the general markets during December by the inspector of this Department. Great care is exercised in drawing samples of goods in the hands of dealers in fertilizers, and it is believed that the analyses presented herewith represent accurately the composition and comparative value of the goods dealers and farmers have

Note—The analysis and inspection of commercial fertilizers is by law done by the Proressor of Chemistry at the College, who is State Chemist. The results being considered of agricultural value are sent out by the Experiment Station. All communications in regard to the Bulletins or analyses should be addressed to State Chemist.

bought, and they also show what the purchaser may expect in the future.

The results of the inspection will be published monthly, that buyers may keep themselves posted on the value of the goods offered by the various manufacturers doing business in this State. Our inspector will be kept constantly on the road taking samples of all brands, and otherwise seeing that the law regulating the sale of fertilizers is carried out.

DEALERS AND FARMERS' SAMPLES.

The State Chemist is required by law to analyze free of charge all properly certified samples that may be sent to him by purchasers. It is manifestly impossible for us to draw and analyze a sample of each consignment; but dealers and farmers are encouraged to *send* us samples of their goods, and we will take pleasure in making the analysis and reporting the same to the sender at the earliest possible time.

INSTRUCTIONS TO FARMERS AND OTHER PURCHASERS OF FERTILIZERS FOR TAKING AND SENDING SAMPLES FOR ANALYSIS FREE OF CHARGE.

In order that the certificate of analysis of the State Chemist may be of value as evidence of the percentage of valuable elements contained therein, it is necessary that the sample analyzed be a fair one, properly certified and prepared. This is necessary that manufacturers and dealers be protected against imposition on the part of unscrupulous purchasers. As the law is very strict with the former, it is but just and right that it be equally so with the latter. It is evidently the purpose of the law to secure honest and fair dealing on the part of all concerned in the sale and purchase of an article, the value of which can be determined only by chemical analysis. We

must, therefore, insist that the following rule for taking and sending samples be rigidly followed:

First.—The sample must be taken in the presence of the seller or agent, or, of two disinterested persons who can read and write.

Second.—A fair sample must be secured. A fair sample of any lot may be obtained by emptying about one-half of from one to six (according as the sample is to represent a ton or a larger quantity) sacks on a clean floor, and thoroughly mixing. The sample should then be prepared by taking small amounts from different portions of the heap and mixing them thorougly, when it is then placed in a glass jar or bottle, which should be securely stoppered and sealed, properly labeled, and forwarded by mail or prepaid express, to the State Chemist.

Third.—At the same time that a sample is sent for analysis, there shall be sent through the mail, in a sealed envelope a certificate signed by the person sending the sample and also by the witnesses, giving the post-office address of the sender and witnesses, a description of how the sample was taken, the number of tons the sample is intended to represent.

FORM OF CERTIFICATE FOR FARMERS TO SEND WITH SAMPLES.

Post Office Address of Sender.....
Date.....

This certifies that the sample of fertilizer sent you this day by..... ..in a sealed..... was taken.....original sacks as shipped by the manufacturer. The sample was prepared in the following manner, viz :

.....
.....
.....
.....

and represents fairly the chemical composition and physical condition of.....tons of.....
..... as offered for sale by.....
.....of.....

Name of Fertilizer.....
Signed .....
Witness.....
Post Office of Witness.....
Witness.....
Post Office of Witness.....

This Department will be glad to furnish blank forms of the above certificate to all who apply for them.

TERMS USED IN THE ANALYSES OF FERTILIZERS.

The names of the valuable elements occurring in commercial fertilizers and fertilizing materials have been so frequently explained in these bulletins that the purchasing public are probably familiar with them. It is necessary to remember only that water soluble phosphoric acid and citrate soluble phosphoric acid, nitrogen and potash are the only substances that have a value in the production of crops. The phosphoric acid that is soluble only in strong acids is probably of very little if any

value when used on most of the soils of this State. The phosphoric acid contained in ground bone, though usually reported as insoluble, may become available for use by crops. We have also allowed a value for the phosphoric acid of bat guano, which becomes available for use when the guano undergoes decomposition in the soil. We give, then, in the tables only the water-soluble, citrate-soluble and available phosphoric acid, nitrogen and potash found in the samples analyzed. The water-soluble added to the citrate-soluble gives the available phosphoric acid.

Under the analyses of samples of each brand, we have given the guarantee of the manufacturers', that purchasers may see in what respect the goods found on the market differ from what they are guaranteed to contain.

FERTILIZER VALUATIONS.

The valuable elements occurring in the fertilizer, viz: phosphoric acid, in its various forms, nitrogen and potash have a definite value in the markets. The raw materials used by manufacturers in preparing their mixed goods are bought by them on a basis of the percentage of these elements carried by the various materials. It is evident, then, that the value of mixed fertilizers and acid phosphates is measured by the current price of the raw materials plus the cost of manipulation. If, then, the amount of these valuable elements in a ton of fertilizer, as shown by chemical analysis, be multiplied by the price per pound of each element and the sum taken for the entire value of the fertilizer, we have a basis for comparison of the value of the various grades of goods offered for sale by manufacturers. The relative values given in the table of analyses are used for comparison only; they are not intended to represent absolute value or the crop producing power of the fertilizer in question. It would be difficult, if not impossible, to assign values for an entire season that would represent, accurately,

the cost to the manufacturers for the reason that the prices of materials are not constant as well as for the fact that the cost of making and placing the goods on the markets may vary from time to time. Our values are not to represent exactly what a fertilizer should sell for; they may be worth slightly more or slightly less than we have given. They are, however, based on a careful examination of trade conditions. They are used for the purpose of comparison. That there is nothing in a name finds an especial application in the fertilizer business; the purchaser simply pays for so many pounds of the elements named above contained in the fertilizer he buys; and, as the amounts of the elements are not apparent to the eye, it is necessary to have them determined by chemical analysis.

The figures that will be used in calculating these relative values are as follows:

	Per pound.
For Nitrogen	13¾ cents
For Potash	5 "
For Water-Soluble Phosphoric Acid	5 "
For Citrate-Soluble Phosphoric Acid	4½ "
For Phosphoric Acid in fine ground bone	3 "
For Phosphoric Acid in medium and coarse bone	2½ "
For Phosphoric Acid in Bat Guano	3 "

All relative values for this fertilizer season will be calculated by the use of the above figures.

HOW RELATIVE VALUES ARE CALCULATED.

For the benefit of those who may not understand clearly how the values given in the table are obtained, we give below an example. The percentages of nitrogen, phosphoric acid and potash represent, of course, pounds and fractions of a pound contained in one hundred pounds of the fertilizer, and, as there are twenty hundred pounds (or 2,000 pounds) in one ton, it is only necessary to multi-

ply these percentages by twenty to find the number of pounds in a ton. Having obtained the number of pounds of the valuable ingredients in a ton, multiply by the price per pound of each ingredient and add the figures thus obtained for the relative value. We will take for an example the first sample found in the bulletin, viz :

Helmet Brand No. 271, manufactured by the Armour Packing Co., Kansas City, Mo.

Per Cent.	Pounds per Ton.	Value per Ton.
2.72 Water-sol. phos. acid x 20	54.40@5c.	$2.72
6.74 Citrate-sol. phos acid x 20	134.80@4½c.	6.07
1.76 Nitrogen x 20.....	35.20@13¾c.	4.84
1.44 Potash x 20.....	28.80@5c.	1.44
Total.		$15.07

The following table contains the analyses of about 50 samples that have been collected this season. These goods are now on sale, and the analyses should receive careful study, as they show the character of the fertilizers being sold. When the analysis is used as a basis of purchase by farmers and dealers, the fertilizer business will be placed on the same plane as other ordinary business transactions. The object of the fertilizer law is to protect, both the manufacturer and the consumer, and it is the object of the Mississippi Control to aid both parties in fair and honest dealings without working a hardship or doing an injustice to any one concerned.

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected
	Armour Packing Company, Kansas City, Mo.	
1337	HELMET BRAND FERTILIZER No. 271....	Canton Cot. W'h'se Co. Canton Guarantee.....
	Birmingham Fertilizer Co., Birmingham, Ala.	
1340	BIRMINGHAM ACID PHOSPHATE	Threefoot Bros & Co. Meridian Guarantee.....
1357	PROLIFIC ACID PHOS.	Threefoot Bros & Co. Meridian Guarantee.....
	Capital Fertilizer Company, Jackson, Miss.	
1333	HIGH GRADE ACID PHOSPHATE.....	I. M. Eagan, Crystal Springs. Guarantee.....
1380	GERMAN KAINIT.....	I. M. Eagan, Crystal Springs. Guarantee.....
1332	NONPAREIL	Becker, Lyell & McGrath, Wes'n
1366	"	I. M. Eagan, Crystal Springs.
1364	"	Peets, Norman Co. Hazlehurst Guarantee.....
1327	RED STAR.....	S. Alcus, Snmmit..... Guarantee.....
	Jackson Fertilizer Company, Jackson, Miss.	
1335	HIGH GRADE ACID PHOSPHATE	Lotterhos & Huber, Crystal Sp. Guarantee.....
1382	ROYAL C.....	E. Atkinson, Summit.....
1368	"	W. H. Chambliss, Newton....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble.	Citrate-Soluble.	Available.	Insoluble.			
1337	6.05	2.72	6.74	9.46	.87	1.76	1.44	$15.07
		5.00	*2.00*	*7.00*	*1.50*	*1.50*	*1.00*	*11.93*
1340	10.66	9.48	3.90	13.38	1.07			12.99
		10.00	*2.00*	*12.00*	*2.00*			*11.80*
1357	12.77	11.45	3.14	14.59	2.15			14.28
		11.00	*2.00*	*13.00*	*2.00*			*12.80*
1333	8.71	8.38	5.04	13.42	.40			12.92
		10.00	*2.00*	*12.00*				*11.80*
1380	3.81						12.70	12.70
							12.00	*12.00*
1332	13.53	6.41	3.43	9.84	.32	1.62	2.27	16.22
1366	12.76	6.26	3.52	9.78	.49	1.60	2.27	16.10
1364	11.79	5.99	3.04	9.03	.14	1.42	2.52	15.15
		7.00	*2.00*	*9.00*	*.50*	*1.50*	*2.00*	*14.93*
1327	12.92	5.97	2.56	8.53	.36	1.59	2.26	14.91
		7.00	*2.00*	*9.00*	*.50*	*1.50*	*2.00*	*14.93*
1335	15.00	13.41	1.68	15.09	2.01			14.92
		10.00	*2.00*	*12.00*	*1.00*			*11.80*
1382	19.03	7.51	2.95	10.46	.42	1.61	1.80	16.39
1368	19.34	6.45	2.00	8.45	1.41	1.77	1.85	14.97

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
1334	ROYAL C.	Lotterhos & Huber, Crystal Sp.
1350	"	J. M. Stephenson, Morton. . . Guarantee. . . . .
1381	GERMAN KAINIT. . . .	Lotterhos & Huber, Crystal Sp. Guarantee. . . . .
	Meridian Fertilizer Factory, Meridian, Miss.	
	MERIDIAN SOUTHERN	
1352	ACID PHOSPHATE. .	W. B. Richardson, Newton. . .
1370	" " "	T. C. Edwards, Shuqualak. . .
1383	" " "	Story & Smyth, Forest. . . . . Guarantee. . . . .
	MERIDIAN BLOOD AND	
1344	BONE	Meridian Fer. Fac., Meridian.
1351	" " "	Story & Smyth, Forest. . . . Guarantee. . . . .
	MERIDIAN HOME MIX-	
1329	TURE	J. McGrath & Sons, Brookhav'n
1353	" " "	W. H. Gallaspy, Hickory. . . . .
1347	" " "	Stokes-Evans Hd'w. Co. Macon
1336	" " "	J. P. Wise & Co., Hazlehurst. Guarantee. . . . .
	Mobile Phos. & Chemical Co Mobile, Ala.	
1343	ENGLISH ACID PHOS.	Winner & Meyer, Meridian. . Guarantee. . . . .
1349	I. X. L. ACID PHOS.	W. J. Hubbard, Shuqualak. .
1342	" " "	Winner & Meyer, Meridian. . Guarantee. . . . .
1348	MOBILE STANDARD. . .	W. J. Hubbard, Shuqnalak. .
1341	" " "	Winner & Meyer, Meridian. . Guarantee. . . . .
	New Orleans Acid & Fert. Co New Orleans, La.	
1331	BLK DIAMOND ACD PH	Louis Cohn & Bros. Brookhav'n

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid Per—Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble.	Citrate-Soluble.	Available.	Insoluble.			
1334	19.53	7.15	3.39	10.54	.27	1.56	1.76	$16.25
1350	12.53	7.47	3.10	10.57	.28	1.53	1.93	16.40
		6.00	*1.60*	*7.60*	*1.00*	*1.55*	*1.80*	*13.50*
1381	3.65						12.16	12.16
							12.00	*12.00*
1352	12.72	10.35	5.23	15.58	1.13			15.06
1370	11.52	11.04	5.24	16.28	.93			15.76
1383	10.49	10.38	5.09	15.47	1.28			14.96
		12.00	*2.00*	*14.00*	*1.00*			*13.80*
1344	14.16	6.83	3.02	9.85	.82	1.90	1.74	16.51
1351	15.81	7.73	3.40	11.13	1.38	1.45	1.63	16.41
		7.75	*2.00*	*9.75*	*2.00*	*1.75*	*1.85*	*16.21*
1329	13.19	7.02	3.82	10.84	.64	1.75	1.71	16.98
1353	12.29	6.27	3.54	9.81	.64	2.01	2.28	17.26
1347	12.15	6.91	3.50	10.41	.81	1.67	2.13	16.78
1336	11.87	6.73	3.60	10.33	.90	1.73	1.96	16.69
		7.75	*2.00*	*9.75*	*1.00*	*1.75*	*1.85*	*16 21*
1343	15.27	9.52	3.38	12.90	1.60			12.56
		12.00	*2.00*	*14.00*	*2.00*			*13.80*
1349	16.24	9.44	2.89	12.33	2.19			12.04
1342	16.66	9.29	3.56	12.85	1.50			12.49
		10.00	*2.00*	*12.00*	*2.00*			*11.80*
1348	12.37	5.96	3.25	9.21	1.38	1.70	1.89	15.45
1341	12.38	6.46	3.54	10.00	1.36	1.82	1.87	16.52
		6.00	*2.00*	*8.00*	*1.50*	*1.65*	*2.00*	*14.34*
1331	16.39	12.37	3.17	15.54	.70			15.22

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
1346	Blk Diamond Acid Ph	D. Rosenbaum's Sons, Meridi'n
		Guarantee.....
1365	Blood, Bone & Potash	S. Cohn & Son, Magnolia.....
1362	" " "	T. L. Cotten, Summit.....
		Guarantee.....
1326	Crescent City Acid Ph	Lampton Mer. Co., Magnolia.
		Guarantee.....
	Dixie Solu. Bone with	
1363	Ammonia & Potash	Earns & Dale, Wesson.....
		Guarantee.....
1355	Gold Dust.....	Turner & Taylor, Hattiesburg
		Guarantee.....
1359	Goldsmith's Imp. Mix	W M McGough & Sons, Morton
1391	" " "	A. B. Wolf, Forest.....
1392	" " "	Hawkins & Co, Hattiesburg.
1393	" " "	Louis Cohn & Bros. Brookhaven
		Guarantee.....
	Standard Guano & Chem. Co	
	New Orleans, La.	
1358	Stern's Eng. Acid Ph.	Threefoot Bros. & Co. Meridian
		Guarantee.....
1361	Blood, Bone and Meat	Hyman Mer. Co., Summit....
		Guarantee.....
1356	Miss. Home Guano..	W. M. Conner, Hattiesburg..
		Guarantee.....
	Stern's Ammoniated	
1354	R. B. Superphosph'te	B. F. Fridge, Ellisville.....
1328	" " "	Hyman Mer. Co., Summit.....
1369	" " "	McLeod&Kennedy, Hattiesb'g
1384	" " "	W. B. Richardson, Newton...
		Guarantee.....
	Threefoot Bros. & Co.,	
	Meridian, Miss.	
1338	Threefoot's Imp. Mix.	Threefoot Bros. & Co. Meridian
		Guarantee.....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water-Soluble.	Citrate-Soluble.	Available.	Insoluble.			
1346	15.22	10.17	3.34	13.51	1.25			13.18
		10.00	*2.00*	*12.00*	*2.00*			*11.80*
1365	6.74	7.59	2.44	10.03	5.36	1.69	1.49	15.92
1362	10.66	6.91	2.41	9.32	5.33	1.67	1.49	15.16
		7.00	*1.50*	*8.50*	*2.00*	*1.65*	*1.00*	*13.89*
1326	14.98	10.99	4.26	15.25	1.33			14.82
		10.00	*2.00*	*12.00*	*2.00*			*11.80*
1363	11.35	8.06	2.64	10.70	1.50	.78	1.84	14.42
		7.00	*2.00*	*9.00*	*2.00*	*.85*	*1.00*	*12.14*
1355	12.23	7.54	2.86	10.40	.92	1.40	1.73	15.69
		7.00	*1.50*	*8.50*	*2.00*	*1.65*	*1.00*	*13.89*
1359	10.64	7.82	2.62	10.44	1.02	1.56	1.87	16.34
1391	12.75	7.91	2.34	10.25	1.28	1.59	1.92	16.31
1392	12.93	6.72	2.99	9.71	.70	1.59	1.92	15.70
1393	10.97	6.90	3.57	10.47	1.04	1.70	1.97	16 76
		7.00	*1.50*	*8.50*	*2.00*	*1.65*	*1.00*	*13 89*
1358	11.97	11.97	6.23	18.20	.46			17 58
		13.00	*3.00*	*16.00*	*1.00*			*15.70*
1361	11.67	5.08	3.23	8.31	1.69	2.45	1.87	16 59
		5.00	*3.25*	*8.25*	*1.00*	*1.70*	*1.50*	*14 10*
1356	9.94	6.83	4.05	10.88	.65	1.63	1.53	16.49
		6.00	*3.00*	*9.00*	*1.00*	*1.65*	*1.50*	*14 74*
1354	6.93	3.52	4.61	8.13	2.72	1.93	1.53	14.51
1328	14.84	3.89	4.67	8.56	1.43	1.35	1.50	13.31
1369	14.20	4.45	3.79	8.24	1.15	1.73	1.60	14.22
1384	11.27	6.59	2.25	8.84	4.43	1.87	1.57	15 33
		5.00	*3.50*	*8.50*	*1.00*	*1.65*	*1.50*	*14 19*
1338	12.70	6.83	3.35	10.18	.86	1.92	2.04	17 17
		8.00	*2.00*	*10.00*	*1.00*	*1.75*	*1.85*	*16.46*

Analyses and Guarantees

OF

FERTILIZERS

ON SALE

IN MISSISSIPPI.

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MISSISSIPPI AGRICULTURAL

EXPERIMENT STATION.

BULLETIN NO. 62. APRIL, 1900.

VARIETIES OF COTTON.

E. R. LLOYD.

TABLE 1.—Gives the yield, per cent of lint, class, length of staple, and price of nineteen varieties of cotton grown by the Experiment Station in 1898.

No fertilizer was used, and each variety was planted in duplicate plots. The excessively wet weather, which prevailed here, greatly lessened the yield on all plots.

The cotton was classed and priced on January 18, 1899, by Mr. L. Aberdee, an expert cotton buyer, whose long experience and ripe judgement, guarantees a correct report.

The price of each variety, as given in the table, is what that cotton was worth at Starkville, Miss., on January 18, 1899. The seed is valued at fifteen cents per bushel.

TABLE 1. **VARIETY COTTON, 1898.**

NAME.	Weight of Seed Cotton per acre pounds	Weight of Lint per acre, pounds	Per cent of lint to seed cotton	Price per pound of lint	Value of lint per acre	Value of seed per acre	Total value of of crop per acre	Class.	Length of Staple inches
Allen's New Hybrid	572.5	145.9	25.5	6⅝	$ 9.66	$1.91	$11.57	Strict Middling	1½
Allen	538.5	154.9	28.8	6¼	9.68	1.72	11.40	Strict Middling	1⅜
Bates' Little Brown Seed	443.5	160.1	36.1	5½	8.80	1.27	10.07	Good Middling	⅞
Duncan's Mam. Prolific	562	183.2	32.6	5¼	9.61	1.70	11.31	Strict Middling	1
Dearing Small Boll	518	199.9	38.6	5½	10.99	1.43	12.42	Good Middling	1
Dickson's Improved	634	206.6	32.6	5¼	10.84	1.92	12.76	Strict Middling	1
Hawkin's Jumbo	711.5	245.4	34.5	5¼	12.88	2.09	14.97	Strict Middling	1
Jones' Improved	622.5	186.7	30.0	5¼	9.80	1.96	11.76	Strict Middling	¾
King's Improved	613	219.4	35.8	5¼	11.51	1.77	13.28	Strict Middling	⅞
Kemper Co. Cotton	668	218.4	32.7	5½	12.01	2.02	14.03	Good Middling	⅞
Mascot	539	194.5	36.1	5½	10.69	1.55	12.24	Good Middling	⅞
Osier Big Boll	644	197.7	30.7	5¼	10.37	2.00	12.37	Strict Middling	1
Peterkin Improved	573.5	202.4	35.3	5¼	10.62	1.66	12.28	Strict Middling	1
Roby's Prolific	584	208.5	35.7	5¼	10.94	1.68	12.62	Strict Middling	1
Smith's Improved	502.5	167.5	33.3	5¼	8.79	1.50	10.29	Strict Middling	1
Station Hybrid	452	143.7	31.8	5¼	7.54	1.38	8.92	Strict Middling	1
Strickland	431.5	138.9	32.2	5¼	7.29	1.31	8.60	Good Middling	1⅛
Truitt's Imp. Premium Prolific	617.5	205 8	33.3	5¼	10.80	1.85	12.65	Strict Middling	1 1-16
Texas Bur	701.5	241.3	34.4	5½	13.27	2.07	15.34	Good Middling	1

TABLE 2.—Gives the yield, per cent. of lint, class, length of staple, and price, of twenty four varieties of cotton grown by the Experiment Station in 1899. No fertilizer was used. The season, as a whole, was favorable, and as shown by coming tables 1 and 2, the increased yield of the same varieties in 1899 is very marked. All the varieties, except two, were planted April 17th. Lee's Improved and Jackson Limbless were not received until after the other varieties had been planted, and these were planted May 9th, which may account for their light yield.

The cotton was classed and priced by Mr. L. Aberdee on Feb. 24th, 1900, and the prices of each variety, as given in the table, is what that cotton would have brought at Starkville, Miss., on Feb. 24th, 1900.

The seed are valued at fifteen cents per bushel:

TABLE 2. **VARIETY COTTON, 1899.**

NAME.	Weight of Seed Cotton per acre, pounds.	Weight of Lint per acre pounds.	Per cent. of lint to seed cotton	Price per pound of lint.	Value of lint per acre.	Value of Seed per acre.	Total value of crop per acre.	Class	Length of staple, inches.
Allen's New Hybrid	583	191.8	32.1	10	$19.18	$1.76	$20.94	Good Middling	1 1/2
Allen	896	255.3	28.5	9 1/4	23.61	1.98	25.54	Strict Middling	1 1/4
Bates' Little Brown Seed	646	221.5	34.3	8 5/8	19.11	1.91	21.02	Str. Good M'dl'g	7/8
Duncan's Mam. Prolific	750	243	32.4	8 3/8	20.35	2.28	22.63	Strict Middling	7/8
Dearing Small Boll	958	339.1	35.4	8 5/8	29.24	2.78	32.02	Str. Good M'dl'g	7/8
Dickson's Improved	958	305.6	31.9	8 1/2	25.97	2.93	28.90	Good Middling	1/2
Hawkin's Jumbo	1250	430	34.4	8 3/4	37.62	3.69	41.31	Middling Fair	7/8
Jones' Improved	1083	346.5	32	8 1/2	29.45	3.31	32.76	Good Middling	1/2
King's Improved	1144	421.2	36.8	8 3/8	35.27	3.25	38.52	Strict Middling	1/2
Kemper Co. Cotton	1167	389	33.3	8 3/4	34.04	3.50	37.54	Middling Fair	1
Mascot	1000	360	36	8 3/8	30.15	2.88	33.03	Strict Middling	1/2
Osier Big Boll	1291	422.1	32.7	8 3/8	35.35	3.9	39.26	Strict Middling	1 1/8
Peterkin Improved	1187	402.4	33.9	8 3/8	33.70	3.53	37.23	Strict Middling	1/2
Roby's Prolific	1312	451.3	34.4	8 3/8	37.79	3.87	41.66	Strict Middling	7/8
Smith's Improved	1104	444.9	40.3	8 3/8	37.26	2.96	40.22	Strict Middling	1
Station Hybrid	875	166.2	19	8 3/8	13.91	3.18	17.09	Strict Middling	1/2
Strickland	729	214.3	29.4	8 1/2	18.21	2.31	20.52	Good Middling	7/8
Truitt's Imp. Premium Prolific	708	242.8	34.3	8 1/4	20.03	2.09	22.12	Middling	7/8
Texas Bur	896	292.2	32.5	8 3/8	24.47	2.71	27.18	Strict Middling	7/8
Whittle	1021	347.1	34	8 3/8	29.07	3.03	32.10	Strict Middling	1
Shine's Early Prolific	791	272.1	34.4	8 1/2	23.12	2.33	25.45	Good Middling	1/2
Cameron's Early	875	264.2	30.2	8 1/4	21.79	2.74	24.53	Middling	1
Lee's Improved	750	243	32.4	8 1/2	20.65	2.28	22.93	Good Middling	1 1-16
Jackson Limbless	575	207	36	8 1/2	17.59	1.65	19.24	Good Middling	1

SUMMARY.—In 1889 the Experiment Station began
tests of varieties of cotton, and since the beginning of
s work over one hundred so-called varieties, including a
ge number of foreign types and varieties have been tested.
ne of the foreign varieties proved of enough value to en-
rage further trials.

In our work with varieties of cotton, covering a period of
ht years, it has almost invariably been the case that the
g staple varieties, when grown on hill land, have made
aller yields, and notwithstanding the higher price paid
the lint, have given lower total values per acre than have
medium or short staple sorts.

The characteristics of any variety may be greatly
nged when the plant is grown on different soils and under
ferent climatic conditions. A variety that has for a num-
of years been grown in the more northern section of the
ton belt will mature its crop early, while if the same
iety be grown for a few years in the southern section of
cotton belt it will, to a great extent, lose its tendency to
ture early, and continue to fruit until checked by frost.
the time of maturity is not altogether a variety difference
t to a great extent, a climatic difference.

Not only the yield, but also the length and value of the
ple are greatly increased by the richness of the soil; this is
ecially true of the long staple varieties.

Now the question that would naturally arise as to
ether or not by the use of leguminous crops, supplement-
by the judicious application of fertilizers, the upland or
l section of the State could not be made to produce a yield
profitable and at the same time grow a staple that would
ss as high and sell for as good a price as does the cotton
own in the Delta. The Station will make some experi-
nts along this line, and for the present, discontinue the
rk with varieties.

In summarizing the work with variety cotton in this bul-
in, the six varieties giving the highest total values per
re are selected from each experiment.

In 1889 twenty-five varieties were planted, and the aver-
e yield of seed cotton per acre was 975.5 pounds, and the
rage yield of lint was 301.9 pounds.

The largest yield of seed cotton, 1330 pounds, was from DICKSON'S IMPROVED; the largest yield of lint, 396.3 pounds, was from TRUITT'S PREMIUM. The smallest yield of seed cotton, 433.7 pounds, was from CHAMPION CLUSTER, which also gave the smallest yield of lint, 157.6 pounds. The largest per cent. of lint, 39.3, was from PETERKIN, and the smallest per cent of lint, 26.5, was from DICKSON'S IMPROVED.

The six varieties giving the highest total values per acre were: TRUITT'S PREMIUM, $40.62; FERRELL'S PROLIFIC, $40.49; JONE'S LONG STAPLE PROLIFIC, $39.48; EXCELSIOR, $37.67; DICKSON'S IMPROVED, $36.20; TRUITT'S IMPROVED PROLIFIC, $35.30.

In 1890 thirty-seven varieties were planted, and the average yield of seed cotton per acre was 719 pounds, and average yield of lint was 298 pounds. The largest yield of seed cotton, 1,270 pounds, was from KING; the largest yield of lint, 420 pounds, was from CHERRY LONG STAPLE. The smallest yield of seed cotton, 247 pounds, was from DUNCAN, which also gave the smallest yield of lint, 63 pounds. The largest per cent of lint, 46.6, was from CHERRY LONG STAPLE, and the smallest per cent of lint, 20.2, was from DICKSON'S IMPROVED.

The six varieties giving the highest total value per acre were: CHERRY LONG STAPLE, $41.34; KING, $39 61; SOUTHERN HOPE, $33.03; EXTRA EARLY CAROLINA, $31.65; TRUITT'S PREMIUM, $31.26; TENN. GOLD DUST, $30.03.

In 1891 forty six varieties planted, and the average yield of seed cotton per acre was 796 pounds, and the average yield of lint was 254 pounds.

The largest yield of seed cotton per acre, 1,370 pounds, was from TEXAS STORM PROOF, which also gave the largest yield of lint, 448 pounds. The smallest yield of seed cotton per acre, 380 pounds, was from WONDERFUL, which also gave the smallest yield of lint, 112 pounds. The largest per cent. of lint, 37 66, was from PETERKIN, and the smallest per cent. of lint, 26.40, was from ALLEN.

The six varieties giving the highest total values per acre were: EUREKA, $36.66; TEXAS STORM PROOF, $35.81; ALLEN, $34 43; DRAKE'S CLUSTER, $30.09; BAILEY, $29.29; WILLIS, $27.30.

In 1892 twenty-six varieties were planted, and the average yield of seed cotton per acre was 652 pounds, and the average yield of lint was 200 pounds.

The largest yield of seed cotton, 991 pounds, was from WARREN, which also gave the largest yield of lint, 330 pounds. The smallest yield of seed cotton, 417 pounds, was from CHERRY LONG STAPLE, which also gave the smallest yield of lint, 125 pounds. The largest per cent. of lint, 34.15, was from SMITH'S STANDARD IMPROVED, and the smallest per cent. of lint, 26.09, was from ALLEN.

The six varieties giving the highest total values per acre were: WARREN, $35.72; JONES' LONG STAPLE PROLIFIC $34.53; DRAKE'S CLUSTER, $32.43; KING, $30.63; SMITH'S STANDARD, $29.51; TRUITT'S PREMIUM, $29.16.

In 1893 twenty-six varieties were planted, and the average yield of seed cotton per acre was 1,112 pounds, and the average yield of lint was 361.7 pounds.

The largest yield of seed cotton, 1,454 pounds, was from POOR MAN'S FRIEND, and the largest yield of lint 553 pounds, was from WILLIS. The smallest yield of seed cotton, 763 pounds, was from SMITH'S STANDARD, which also gave the smallest yield of lint, 252 pounds. The largest per cent. of lint, 38.86, was from BATES FAVORITE, and the smallest per cent. of lint, 27.96, was from COOK.

The six varieties giving the highest total values per acre were: COOK, $45.48; POOR MAN'S FRIEND, $43.66; TRUITT'S PREMIUM, $37.92; DICKSON'S IMPROVED, $35.78; WARREN, $35.78; BATES BIG BOLL, $35.61.

In 1898 nineteen varities were planted, and the average yield of seed cotton per acre was 575.2 pounds, and the average yield of lint was 190.4 pounds.

The largest yield of seed cotton, 711.5 pounds, was from HAWKIN'S JUMBO, which also gave the largest yield of lint, 245.4 pounds. The smallest yield of seed cotton, 431.5 pounds, was from STRICKLAND, which also gave the smallest yield of lint, 138.9 pounds. The largest per cent. of lint, 38.6, was from DEARING SMALL BOLL, and the smallest per cent. of lint, 25.5, was from ALLEN'S NEW HYBRID.

The six varieties giving the highest total values per acre were: TEXAS BUR, $15.34; HAWKIN'S JUMBO, $14.97; KEMPER

Co. Cotton, $14.03; King's Improved, $13.28; Dickson's Improved, $12.76; Truitt's Improved Premium Prolific, $12.65.

In 1899 twenty-four varieties were planted, and the average yield of seed cotton per acre was 939.5 pounds, and the average yield of lint was 311.4 pounds.

The largest yield of seed cotton, 1,312 pounds, was from Roby's Prolific, which also gave the largest yield of lint, 451.3 pounds. The smallest yield of seed cotton, 575 pounds, was from Jackson Limbless, and the smallest yield of lint, 166 2 pounds, was from Station Hybrid. The largest per cent. of lint, 40.3, was from Smith's Improved, and the smallest per cent. of lint, 19, was from Station Hybrid.

The six varieties giving the highest total values per acre were: Roby's Prolific, $41.66; Hawkin's Jumbo, $41.31; Smith's Improved, $40.22; Ozier Big Boll, $39.26; King's Improved, $38.52; Kemper Co. Cotton, $37.54.

The Station has no seed for sale or distribution; we give below the addresses of parties from whom seed were received:

Allen's New Hybrid..Dept. Agriculture, Washington, D. C.
Allen.....J. B. Allen, Port Gibson, Miss.
Bates Little Brown Seed.....R. Bates, Jackson, S. C.
Duncan's Mammoth Prolific....M. V. Johnson, Atlanta, Ga.
Dearing Small Boll.....J. J. Dearing, Covington, Ga.
Dickson's Improved.....Capers Dickson, Oxford, Ga.
Hawkin's Jumbo.....B. W. Hawkins, Nona, Ga.
Jones' Improved.....J. F. Jones, Hogansville, Ga.
King's Improved.....T. J. King, Louisburg, N. C.
Kemper Co. Cotton.....Dr. S. D. Stinnis, Moscow, Miss.
Mascot.....J. G. Ruan, Macon, Ga.
Ozier Big Boll.....J. D. Ozier, Corinth, Miss.
Peterkin Improved.....M. W. Johnson, Atlanta, Ga.
Roby's Prolific .....J. E. Roby, Goodman, Miss.
Smith's Imyroved.....E. A. Smith, Conyers, Ga.
Station Hybrid.....Miss. Experiment Station.
Strickland.....Curry-Arrington Co., Rome, Ga.
Truitt's Imp. Prem. Prolific..G. W. Truitt, La Grange, Ga.
Texas Bur.....C. E. Smith, Locust Grove, Ga.
Whittle.....W. C. Harbaur, Daleville, Miss.
Shine's Early Prolific.....J. A. Shine, Faison, N. C.
Cameron's Early.....R. R. Cameron, West Green, Ala.
Lee's Improved.....B. E. Lee, Wildwood, Ala.
Jackson Limbless....Dept. Agriculture, Washington, D. C.

Mississippi Agricultural Experiment Station.

Bulletin No. 63.

INOCULATION OF SOILS

BY

GLENN W. HERRICK.

ROOTS OF BUR CLOVER SHOWING TUBERCLES

AGRICULTURAL COLLEGE, MISS.
JUNE, 1900.

MERIDIAN NEWS PRINT.

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*First Annual Report, 1888. Second Annual Report, 1889. Third Annual Report, 1890. *Fourth Annual Report, 1891. *Fifth Annual Report, 1892. *Sixth Annual Report, 1893. Seventh Annual Report, 1894. Eighth Annual Report, 1895. Ninth Annual Report, 1896. Tenth Annual Report, 1897. Eleventh Annual Report, 1898. Twelfth Annual Report, 1899.

*Out of print.

The Bulletins of this Station are sent free to all farmers in Mississippi who apply for them.

Address all communications to the MISSISSIPPI EXPERIMENT STATION, Agricultural College, Mississippi.

INOCULATION OF SOILS.

Air—Two and a quarter centuries ago the important discovery was made that the air we breathe and that is everywhere about us, was made up, very largely, of a mixture of two gases. One of these called oxygen, was found to be a gas absolutely necessary to the life of animals. The other called nitrogen was fouud to be a gas which animals could not breathe when pure, and in which a candle would not burn. Yet strange to say this nitrogen constitutes nearly four-fifths of the air we breathe; while oxygen constitutes only one-fifth. Besides these two gases there is always present in the air, a very small quantity of carbonic acid gas. It comes from, decaying substances, from fires and from the breaths of animals. So in a short time the air would be loaded with it and we should all die, if there were not something to take it out of the air and put oxygen in its place.

Relation of Air to Plants—For a long time after this discovery no one knew or even thought that this air about us had any relation to plants. Finally some one accidentally discovered, that, if a few plants were placed in a space containing nothing but impure air, that is, air containing a good deal of carbonic acid gas, this air would soon be purified again. Evidently then the plants did it. In other words, it soon became known that one thing plants did was to take up carbonic acid gas and give off oxygen. Consequently we readily see how dependant we are on plants.

But the question that agitated the people most during all those years was, did plants do anything with the nitrogen in the air? Could plants take up the nitrogen from the air, in the same way that they took up the carbonic acid gas, and use it to aid themselves in growing? Here was this great ocean of air about us, fifty or more miles in depth, and four-fifths of which was nitrogen and yet so far as any one could tell plants were unable to take it and use it. So farmers went on, and are yet going on,

buying nitrogen at the rate of 12 to 15 cents per pound. It is the most expensive fertilizer element the farmer has to buy and perhaps one of the most needful. As late however, as 1850 a French experimenter declared that certain plants cou d take up the free nitrogen of the air and put it into a form that could be used by the plants as food. For this he was ridiculed and scoffed at until life became almost a burden. Nevertheless, farmers began to find that if they raised a good crop of clover on a piece of ground they could raise a good crop of wheat on that same ground the next season. Any intelligent Southern farmer knows that, if he plows under a crop of cow peas or hairy vetch his crop of whatever follows will be increased in yield. And there lies the whole secret.

A Remarkable Property of Leguminous Plants—Examine, if you will, roots of bur clover (see picture on cover), hairy vetch or alfalfa and in most cases you will find small white tubercles or nodules on them. Inside of these nodules are hundreds of minute germs or bacteria, that have the power of gathering up the free nitrogen of the air and putting it into a form that the plant can use as food. Then here we have the two factors ready to our use without cost that will go far toward enriching and improving our worn out land; and increasing our crops. One is the air, four-fifths of which is nitrogen and fifty miles deep all over the earths the other leguminous plants, such as hairy vetch, cow peas, velvet beans, clover, alfalfa, melilotus, and many others. It is quite probable

VETCH ROOTS PLAT I. SHOWING TUBERCLES.

that this power is not restricted to leguminous plants alone but they are preeminently the nitrogen-gatherers. Just how the germs inside the nodules take up the free nitrogen and work it over into available food for the plant cannot be told. They do it however and that is enough for our present purpose. They not only manufacture enough available nitrogen for the plant on which they live, but store up goodly quantities in the nodules, which will go to the succeeding crop. Moreover after the vetch or clover is cut, the nodules decay, setting free the little germs, which will live in the soil and produce nodules on the next crop of vetch. Thus the farmer may go on enriching his soils by planting leguminous crops.

Inoculation of Soils.—It is quite probable that if we were to examine the roots of vetch, clover, or peas in certain parts of our State we should find no tubercles on them. It is even more probable that we would find localities in which the roots had but a few nodules. In both these cases more of the germs need to be added to the soil. In other words the soil needs to be inoculated. One can always know whether the soil, on which clover, vetch, or peas are growing, is deficient in nitrogen-gathering germs, by examining the roots of these crops. If the roots bear no tubercles then there are no germs in the soil. If the roots bear only a few, small tubercles then the soil is in need of more germs.

Field Experiment with Hairy Vetch (Vicia Villosa.)—In the month of October, 1898, an experiment with hairy vetch was begun to determine, if possible, what effect the inoculation of the soil might have on its immediate growth. For this purpose a piece of ground, on which it was supposed vetch had never before been grown, was selected. This piece was divided into three equal plats, and eight rows of vetch, two feet apart, were sown in drills on each plat. Each plat of eight rows was treated differently, as the following will show.

The first eight rows, beginning on the east side, were inoculated by bringing earth from a field on which vetch was growing, that had plenty of nodules on the roots. Care was taken to get the earth close about the roots, even many of the vetch roots with nodules being mingled with the earth, to be sure of inoculation. This dirt was then scattered in the drills on top of the vetch which had already been sown. Both were then covered with soil.

The second plat of eight rows was also sown in drills, but no earth or water containing germs was put with the seed, so that this plat was supposed to be wholly uninoculated. The object was to have this plat serve as a check to the two others.

The third plat of eight rows was also sown in drills, but the seeds were first wetted with water containing nodule germs. Some earth, from the same field of vetch used in the first plat, was placed in a pail of water. It was then stirred thoroughly and allowed to settle. The seed were then wet with this water and planted immediately.

Of course in sowing an acre or more of vetch it would be necessary to allow the seed to dry so that they could easily be scattered.

PLAN OF VETCH PLATS.

EAST.	NO. 1.	NO. 2.	NO. 3.
	Inoculated by scattering dry earth in drills.	Not inoculated, to serve as a check.	Inoculated with water containing germs.
	Yield of green forage, 79 pounds. Increase in yield due to inoculation, 64.6 p. c.	Yield of green forage, 49 pounds.	Yield of green forage, 64.5 pounds. Increase in yield due to inoculation, 34 p. c.

Results—The stand of vetch on these three plats was not at all promising. They had been sown so late that they did not get a good start in the fall, and this, followed by our extreme cold winter, caused the plats to look very thin in the spring. No. 1 looked especially discouraging. By the latter part of April, however, this plat had out-

grown No. 2 nearly twice. The growth was splendid and covered the ground with a thick mat. Some of the plants were so strong as to be in bloom at this time. A week later the roots in this plat were examined for nodules. Great clusters of them were found (Fig. 1), besides multitudes of individual ones. At the same time the roots of vetch in No. 2 were examined. A few nodules were found, but all were small and not so vigorous in appearance as those of plat 1. It was evident, however, that this plat had been slightly inoculated, either by vetch having been grown there before, or by some germs having been scattered over it in our work, or by the wind, from an adjoining field. The inoculation changed our final result somewhat, very probably, yet it was wholly inadequate for the needs of the crop, as will be seen.

The plants on plat 2 at this time were not so tall, were less rank in growth, and were evidently suffering more from drouth. This was probably due to the fact that the ground was not well covered, and hence evaporation took place more readily. None of them were in bloom.

Plat 3, although it had appeared the best of the three in the spring, was now (in April) second to plat 1. The roots showed fewer nodules than plat 1, but many more than plat 2. The growth of vetch was much ranker and heavier than on plat 2, and to the eye appeared nearly as good as that on plat 1.

Actual Weight of Green Forage on the Three Plats.—On May 20th, before the seed were fully matured, the vetch was cut and carefully weighed.

The green forage grown on plat 1 weighed 79 pounds. That on plat 2 weighed 48 pounds, while plat 3 yielded 64½ pounds.

In other words, by inoculating the soil with dry dirt, plat 1 gave an increase in yield over plat 2 of very nearly 65 per cent. To be accurate, 64.6 per cent. Plat 3 gave an increase in yield over plat 2 of over 34 per cent. But

the above increase was obtained in face of the fact that our plat used to serve as a check was inoculated to a small degree. If this had been absolutely free from germs, I confidently believe the increase would have been double. That is mere speculation, however, and we had best confine ourselves to actual results.

Let us see what our results would give on an acre:

Suppose an uninoculated field to yield one ton of vetch per acre. Then according to the yield on plat 1, by inoculation, that field would yield 1 65-100 tons per acre, an increase not to be despised. On a field of twenty acres, at the same rate, the yield would be increased from 20 to 33 tons.

Addition of Available Nitrogen to the Soil.—Perhaps, after all, the thing most important in this experiment was the proof of the plant food in the way of nitrogen, added to plats 1 and 2. Each nodule found on the roots of the vetch in those plats represented a certain amount of available nitrogen, ready for the succeeding crop of wheat, oats, or what not. Each nodule was a nitrogen fertilizer factory for the farmer, gathering the nitrogen from the air in the soil and putting it in the form of food. The number of nodules on plats 1 and 3 far exceeded that on plat 2, hence the amount of available nitrogen left in the soil must have been correspondly greater. In other words, the more thoroughly a crop of vetch, cow peas, alfalfa, or clover is inoculated, the more plant food it adds to the soil. If uninoculated, these crops probably add no more nitrogen food than any other crop.

Will the Germs From One Kind of Plant Produce Nodules on the Roots of Another Kind of Plant?—At the same time we sowed the above plats of hairy vetch we also sowed at some distance from them three similar plats of the common vetch (Vicia sativa). These three plats were treated in exactly the same manner as those of hairy vetch. The earth for inoculation was ob-

tained from the same field of hairy vetch that was used in the first experiment. The roots of the vetch in plats 1 and 3 were covered with an abundance of nodules. Hence, in this case, the germs of one species of vetch produced nodules on another and different species of vetch. Unfortunately the common vetch produced no stand in the spring. It was nearly all washed out by the heavy rains of early winter.

In the case of plat experiments with crimson clover, I used soil obtained from about the roots of red clover, and found that an abundance of nodules was formed on the crimson clover roots.

Without going into a scientific discussion as to whether there is a different species or variety of germ for every species of plant, suffice it to say that probably the germs from any one clover will inoculate all other clovers to a greater or less degree. Likewise the germs from any vetch will inoculate all other true vetches. Our experiments above established this in at least two cases. In other words, the germs from one plant will inoculate other plants closely related to it. In fact, it has been shown by experiment that the germs from beans will inoculate peas and vetch, for these are all closely related.*

*MacDougall in Trans. Bot. Soc., Edin., 1897.

However, the very best results will be obtained by using germs from the same plant as that which we are going to inoculate.

Necessity of Other Fertilizers in the Soil.—It must not be imagined from what has been said that leguminous plants, if inoculated, will perform miracles of growth. One will be doomed to disappointment, for they will not. It must be remembered that they need phosphoric acid and potash as much as ever. These they cannot gather, and although they can gather nitrogen they cannot live by nitrogen alone. So in cases where

the above fertilizers are absent from the soil they should be added in order to obtain the best results.

Methods of Inoculating Soils.—There are at least three methods of inoculating soil with these germs. One method is to find a field on which a crop of vetch, peas or clover has grown, on the roots of which an abundance of nodules was developed. In such a case one may be sure that the soil of the old vetch or clover field is full of germs that escaped from the nodules when they decayed. Then draw dirt from this field, about one ton to the acre, and scatter as evenly as possible over the one to be inoculated. It should then be quickly harrowed in, especially if it is a hot, clear day, because sunshine kills the germs. The dirt should be taken preferably from two to three inches below the surface. A second method is to obtain some earth from an old inoculated vetch or clover field, put it in a vessel and pour water on it. Then stir thoroughly, allow it to settle, and use this water to thoroughly wet the seeds to be sown. The water thus obtained is full of the germs from the soil, which will stick to the seeds as they dry. Here again we should use care and not dry the seeds in the sunlight. It seems to me that this is the most economic way of inoculating a field. It is not a difficult matter to spread out a bushel or two of clover or vetch seed on an old cloth or tight floor, and sprinkle with plenty of the muddy germ water. The seeds may be left right there until they dry, if they are in the shade, and then are ready to sow. A third method is to buy from Victor Koechl & Co., 79 Murray street, New York City, a material known as nitragin. This is simply a gelatinous substance full of the germs one wishes to use. It is made in Germany, and consequently in the trip across the ocean, and then to us, it is very liable to ferment and spoil. We ordered it in the winter, however, and had no such trouble. It costs $1.25 per bottle, and to inoculate an acre two bottles are needed. Full direc-

tions for use accompany each bottle. In ordering always state the kind of germs desired, whether it is clover, vetch, pea, bean, or alfalfa, etc.

Summary.—The air all about us is composed principally of two free gases, oxygen and nitrogen.

Leguminous plants, such as clover, vetch, peas, beans, alfalfa, etc., are able to take up the free nitrogen of the air and change it to a form that can be used as food. A part of this the plants use immediately in growing and a part is left in the ground for the succeeding crop. These leguminous plants are able to do this by means of bacteria or germs that grow on their roots and produce nodules there.

In some soils these germs are not present at all, while in some soils they are present, but not in sufficient numbers to produce the best results. Such soils should be inoculated.

By inoculation is meant the adding of the germs in some way to the soil.

Experiments with vetch have shown that the crop is greatly increased by inoculation, and at the same time that nitrogen is added to the soil.

Experiments show that the germs from one plant will inoculate plants very closely related. But the best results will probably be obtained by using germs from the same species of plant one wishes to inoculate.

MISSISSIPPI AGRICULTURAL EXPERIMENT STATION.

BULLETIN NO. 64

Analyses of Commercial Fertilizers on Sale in the State.

CHEMICAL LABORATORY.

AGRICULTURAL COLLEGE, MISS.

AUGUST 15TH, 1900.

CLARION-LEDGER PRINT.

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MISSISSIPPI FERTILIZER CONTROL.

Inspection and Analyses of Fertilizers,

BY THE CHEMICAL DEPARTMENT OF THE

Mississippi Agricultural & Mechanical College.

W. F HAND, State Chemist.
J. S. CARROLL, Ass't Chem't and Fertilizer Insp'r.
E. B. FERRIS, Assistant Chemist.
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I. D. SESSUMS, Assistant Chemist.

The analyses of commercial fertilizers published in this bulletin represent the composition and comparative value of the goods the farmers of this State have purchased during the season just passed. The samples analyzed were taken in the general markets by the regular inspector of the Department. It is our object to exercise the greatest care in sampling and analyzing the fertilizers and fertilizing materials offered to farmers and dealers, and, if this object

Note. The inspection of commercial fertilizers is by law done under the supervision of the Professor of Chemistry at the College, who is State Chemist. The results being considered of agricultural value are sent out by the Experiment Station. All communications in regard to the Bulletins or analyses should be addressed to State Chemist.

has been accomplished, the results of the year's inspection are trustworthy. It is hoped that manufacturers, dealers and farmers feel that the results obtained deal fairly and impartially with each brand of fertilizer found in the markets of the State.

It will be noticed that we have adhered to our practice of devoting a great deal of attention to those brands that have, during this, as well as past years, proved most popular with the purchasing public. We have, therefore, analyzed from ten to fifteen samples of each of these brands, and, as these samples were drawn from time to time during the business season, the average of all the analyses made will show quite clearly the character of the fertilizers that have been sold under the brand names. These averages are printed in bold type, and buyers are invited to study them. For, convenience the *guarantees* of the manufacturers are printed immediately below the *average* analyses, and, consequently, it requires only a glance to ascertain how well promises have been kept.

GENERAL CHARACTER OF BUSINESS.

By an inspection of the table of analyses and guarantees, it will be seen that, as a general rule, the fertilizers sold last season have fully redeemed the claims made by the manufacturers. In some cases, however, the samples analyzed have only approximated or have fallen materially below the guarantee on file in this office. These discrepancies have been brought about in the main by mistakes of the makers. As a business proposition no fertilizer manufacturer could afford to deal unfairly with the farmers of this State; he would be speedily detected and would lose, not only his reputation, but his goods as well. All manufacturers doing business with us have shown a desire to comply with the requirements of our law, and they have generally met the conditions squarely with honest goods.

DEALERS' AND FARMERS' SAMPLES.

During the year, we have received a number of samples

from farmers and dealers with a request for an analysis. This is a procedure on the part of purchasers to be made encouraged; but the Department has not been as useful to the public in this respect as it could be. This is due to the fact that these samples are sent without the proper certificate. It requires a chemist to realize properly the care necessary in sampling a consignment of fertilizer, that the sample obtained may be indicative of the whole bulk from which it is drawn.

Some of the samples received have not been analyzed, as no assurances were given that they were properly obtained and prepared. Those who wish to have their goods analyzed during the coming season may fill out the blank form given in this bulletin and forward it through the mail at the same time the sample is sent, or we will furnish such blanks to those who apply for them. These samples will receive our prompt attention.

That section of the law providing for free analyses will be found below.

"*Chemist to Analyze Samples Sent by Farmers or Other Purchasers:* The State Chemist shall also analyze all fair samples of fertilizers properly certified and prepared which may be furnished to him by the farmers and other purchasers for use free of charge, and shall give a certificate thereof."

INSTRUCTIONS TO FARMERS AND OTHER PURCHASERS OF FERTILIZERS FOR TAKING AND SENDING SAMPLES FOR ANALYSIS FREE OF CHARGE.

In order that the certificate of analysis of the State Chemist may be of value as evidence of the percentage of valuable elements contained therein, it is necessary that the sample analyzed be a fair one, properly certified and prepared. This is necessary that manufacturers and dealers be protected against imposition on the part of unscrupulous purchasers. As the law is very strict with the former, it is but just and right that it be equally so with the latter. It

is evidently the purpose of the law to secure honest and fair dealing on the part of all concerned in the sale and purchase of an article, the value of which can be determined only by chemical analysis. We must, therefore, insist that the following rule for taking and sending samples be rigidly followed :

First—The sample must be taken in the presence of the seller or agent, or of two disinterested persons who can read and write.

Second—A fair sample must be secured. A fair sample of any lot may be obtained by emptying about one-fourth of from two to six (according as the sample is to represent a ton or a larger quantity) sacks on a clean floor, and thoroughly mixing. The sample should then be prepared by taking small amounts from different portions of the heap and mixing them thoroughly, when it is then placed in a glass jar or bottle, which should be securely stoppered and sealed, properly labeled, and forwarded by mail or prepaid express, to the State Chemist.

Third—At the same time that a sample is sent for analysis, there must be sent through the mail, in a sealed envelope a certificate signed by the person sending the sample and also by the witnesses, giving the postoffice address of the sender and witnesses, a description of the manner in which the sample was taken, the number of tons the sample is intended to represent.

FORM OF CERTIBICATE FOR FARMERS TO SEND WITH SAMPLES.

Postoffice Address of Sender.....

Date..... .....

This certifies that the sample of fertilizer sent you this day by.....in a sealed..... was taken .....original sacks as shipped by the manufacturer. The sample was prepared in the following manner, viz :

....

....

....

....

and represents fairly the chemical composition and physical condition of.....tons of.....

.....as offered for sale by.....

....of.....

Name of fertilizer.....

Signed.....

Witness.....

Postoffice of Witness.....

Witness..... ....

Postoffice of Witness.....

This Department will be glad to furnish blank forms of the above certificate to all who apply for them.

TERMS USED IN THE ANALYSES OF FERTILIZERS.

The names of the valuable elements occurring in commercial fertilizers and fertilizing materials have been so frequently explained in these bulletins that the purchasing public are probably familiar with them. It is necessary to remember only that water soluble phosphoric acid and citrate soluble phosphoric acid, nitrogen and potash are the only substances that have a value in the production of crops. The phosphoric acid that is soluble only in strong acids is probably of very little if any value when applied to most soils of the State. The value of the phosphoric acid occurring in ground bones seems to depend somewhat on the state of division—the more finely ground being the more available. Bones have been used as a fertilizer for more than a century, and in earlier times they were applied in the raw state. Field tests made in this country and abroad during the last few years indicate that the high regard in which ground bones are held in the estimation of many farmers is due more to the beneficial action of the nitrogen contained in them than to the phosphoric acid. It may be accepted as true that "quick acting" manures pay best, and, while the nitrogen of bone meal may become available for use by crops quickly enough, the phosphoric is certainly not so rapidly changed to the soluble form. The *agricultural* value of bones, then, is most probably below the *commercial* value. However, we have given a value to the phosphoric acid of both fine and course bone meal.

A value is also given to the phosphoric acid contained in prepared bat guano.

FERTILIZER VALUATIONS.

The valuable elements occurring in the fertilizer, viz: phosphoric acid, in its various forms, nitrogen and potash have a definite value in the markets. The raw materials used by manufacturers in preparing their mixed goods are bought by them on a basis of the percentage of these ele-

ments carried by the various materials. It is evident, then, that the value of mixed fertilizers and acid phosphates is measured by the current price of the raw materials plus the cost of manipulation. If, then, the amount of these valuable elements in a ton of fertilizer, as shown by chemical analysis, be multiplied by the price per pound of each element and the sum taken for the entire value of the fertilizer, we have a basis for comparison of the value of the various grades of goods offered for sale by manufacturers. The relative values given in the table of analyses are used for comparison only; they are not intended to represent *absolute value or the crop producing power* of the fertilizer in question. It would be difficult, if not impossible, to assign values for an entire season that would represent, accurately, the cost to the manufacturers for the reason that the prices of materials are not constant as well as for the fact that the cost of making and placing the goods on the markets may vary from time to time. Our values are not to represent exactly what a fertilizer should sell for; they may be worth slightly more or slightly less than we have given. They are, however, based on a careful examination of trade conditions. They are used for the purpose of comparison.

The figures that will be used in calculating these relative values are as follows:

	Per Pound.
For Nitrogen	13½ cents
For Potash	5 cents
For Water-soluble Phosphoric Acid	5 cents
For Citrate-soluble Phosphoric Acid	4½ cents
For Phosphoric Acid in fine ground bone	3 cents
For Phosphoric Acid in medium and coarse bone	2½ cents

All relative values for this fertilizer season have been calculated by the use of the above figures.

HOW RELATIVE COMMERCIAL VALUES ARE CALCULATED.

The method of calculating the relative commercial value of a fertilizer from the chemical analysis has been explained

in the preceeding publications of the Department. The percentages of water-soluble and citrate-soluble phosphoric acid, nitrogen and potash found by analysis, of course, represent pounds and fractions of a pound of these substances contained in a hundred pounds of the fertilizer. If we multiply these percentages by twenty the products will be the number of pounds of the valuable elements contained in one ton. Now, by multiplying the number of pounds found per ton by the price per pound and adding these products, the relative commercial value will be obtained.

UNIFORM METHODS OF STATING GUARANTEES.

In a former bulletin, attention was called to the fact that an effort is being made by the various official chemists throughout the country to provide for a uniform method of printing the guarantees on bags. A method of stating guarantees that would be common to all States commends itself in many respects. A plain unvarnished statement of what the goods contain is all manufacturers should desire now, that the fertilizer trade is on a business basis. The simplest method of stating a guarantee is the best for the purchaser, and the practice of printing on the bags long lists of "equivalents" would seem of doubtful advantage to the manufacturers themselves. The sliding scale is confusing and means nothing. Manufacturers are, of course, at liberty to brand their bags as they think best, and we have no desire to interfere with their private business methods, but we would be very glad to see the following systems of printing guarantees on fertilizer bags adopted :

Pounds.....

Name of brand.....

Manufactured by.....

Address .....

GUARANTEED ANALYSIS.

Water-Soluble phosphoric acid.....per cent.

Reverted phosphoric acid.....per cent.

Insoluble phosphoric acid..... .....per cent.

Total phosphoric acid..... .....per cent.

Potash soluble in water..... per cent.

Nitrogen.....per cent.

If it is desired to state the form of potash salt used in making up the goods, this could be placed on the same line with the potash percentage as follows :

Potash soluble in water (in form of sulphate).....

.... etc.

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	ARMOUR PACKING CO., Kansas City, Mo.	
1337	Helmet Brand Fertilizer. No 271	Canton Cotton W'house Co., Canton
1512	Helmet Brand Fertilizer, No. 271.....	W. L. Bourland, Amory.....
		Average .....
		Guarantee .. ....
1528	African Cotton Grower...	W. L. Bourland, Amory.....
		Guarantee ....
	A. D. ADAIR & MCCARTY BROS. Atlanta, Ga.	
1587	Farish Furman Formula..	J. T. Gayer, Iuka..... .....
		Guarantee..... .....
	BIRMINGHAM FERTILIZER COMPANY. Birmingham, Ala.	
1340	Birmingham Acid Phos..	Threefoot, Bros. & Co., Meridian...
1570	Birmingham Acid Phos..	D. Rosenbaum's Sons, Meridian....
1628	Birmingham Acid Phos..	Threefoot Bros. & Co., Meridian....
		Average .....
		Guarantee.....
1357	Prolific Acid Phosphate..	Threefoot Bros. & Co., Meridian ...
1571	Prolific Acid Phosphate..	J. M. Carter & Co., Quitman... ....
		Average ....
		Guarantee..... ..
1457	Birmingham H. G. Fert..	Gilmore & May, Amory.... .....
1529	Birmingham H. G. Fert..	Gilmore & May, Amory .. ..
		Average .....
		Guarantee .....
	SOLD BY BLUMENFELD & FRIED, Ackerman, Miss.	
1500	Blumenfeld & Fried's Imp. Mixture	Blumenfeld & Fried, Ackerman....
1549	Blumenfeld & Fried's Imp. Mixture	Blumenfield & Fried, Ackerman....
		Average ....
		Guarantee ....
	CAPITAL FERTILIZER CO , Jackson, Miss.	
1333	H. G. Acid Phosphate...	I. M. Eagan, Crystal Springs. .....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value per ton.
		Water—Soluole.	Citrite—Soluble	Available.	Insoluble.			
1337	6.05	2.72	6.74	9.46	.87	1.76	1.44	15.07
1512	6.08	3.21	5.00	8 21	1.37	1.85	1 32	14.12
	6.07	**2 96**	**5.87**	**8 84**	**1 12**	**1.80**	**1 38**	**14.59**
		5.00	*2.00*	*7.00*	*1.50*	*1.50*	*1.00*	*11.93*
1528	6.43	4.50	6.50	11.00	2 56	2.53	2.88	20.19
		6.00	*3.00*	*9.00*	*1.00*	*2.50*	*3 00*	*18.58*
1587	14 05	7 91	2.48	10.39	.28		1.99	12.13
		6 00	*4.00*	*10 00*	*2.00*		*2.00*	*11.60*
1340	10 66	9 48	3 90	13.38	1.07			12.99
1570	11.07	5 12	5.75	10 87	3.32			10 30
1628	13.10	10 54	2.75	13 29	1 25			13.02
	11 61	**8 38**	**4 13**	**12 88**	**1 88**			**12 10**
		10 00	*2.00*	*12.00*	*2 00*			*11.80*
1357	12 77	11.45	3.14	14.59	2.15			14 28
1571	12 63	10 94	3 03	13.97	2.69			13.67
	12.70	**11 20**	**3 08**	**14 28**	**2 42**			**13 98**
		11.00	*2.00*	*13 00*	*2.00*			*12.80*
1457	14.75	8 02	2.33	10 35	1.42	1.81	2 71	17.80
1529	13.92	10.32	1.96	12.28	1.77	1.58	2.57	19 00
	14.33	**9.17**	**2.15**	**11 34**	**1.59**	**1.69**	**2 64**	**18 40**
		7.00	*2.00*	*9.00*	*2.00*	*1.64*	*2.00*	*15.31*
1500	14.89	5.18	3.08	8.26	1.47	2.00	2.33	15.78
1549	14.37	7.79	1.94	9.73	2·96	2.17	2.20	17.70
	14 63	**6 49**	**2.51**	**9 00**	**2 22**	**2 09**	**2 26**	**16.74**
		7.75	*2.00*	9.75	*1.00*	*1.75*	*1.85*	*16.21*
1333	8.71	8.38	5.04	13.42	.40			12.92

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
1427	H. G. Acid Phosphate	M. J. L. Hoye's Sons, Newton
1513	H G. Acid Phosphate	A. E. Kelly, Kosciusko
1551	H. G. Acid Phosphate	Peets-Norman Co., Hazlehurst
		Average
		Guarantee
1380	German Kainit	I. M. Eagan, Crystal Springs
		Guarantee
1439	Miss Guano	Moore Bros., Morton
1536	Miss. Guano	Howie Bros., Morton
1552	Miss. Guano	Max Priebatsch, Brookhaven
1567	Miss. Guano	Jno P. Clower, Crystal Springs
		Average
		Guarantee
1475	Nonpareil	W. H. Barron & Co., Crystal Sp'gs.
1332	Nonpareil	Becker, Lyell & McGrath Co. Wesson
1366	Nonpareil	I. M. Eagan, Crystal Springs
1411	Nonpareil	Ford Bros. Co., Centreville
1364	Nonpareil	Peets Norman Co., Hazlehurst
1454	Nonpareil	Waddell, May & Barnes, Brandon
1537	Nonpareil	Stingley, Taylor & Co., Pelahatchie.
1553	Nonpareil	C. C. Bates, Gloster
1568	Nonpareil	Jno. P. Clower, Crystal Springs
1616	Nonpareil	A. E. Kelly, Kosciusko
1617	Nonpariel	W. H. Gillaspy, Hickory
1618	Nonpareil	W. M. McGough, Morton.
		Average
		Guarantee
1436	Our Vegetable Grower	Ford Bros. Co., Centerville
		Guarantee
1417	Producer Brand	Max Priebatsch, Brookhaven
		Guarantee
1327	Red Star	S. Alcus, Summit
1423	Red Star	T. B. Gaddis, Morton
1514	Red Star	G. W. Winters, McCool
1538	Red Star	McMullan & Bolton, Newton
		Average
		Guarantee
	CONTINENTAL FERTILIZER COMPANY, Nashville, Tennessee.	
1496	Sunny South Acid Phosphate	J. A. Mehaffey, Columbus
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value per ton.
		Water—soluble.	Citrite—soluble.	Available.	Insoluble.			
1427	11 43	9.95	3.97	13.92	.55			13.52
1513	13.35	9.58	3 65	13 23	.63			12.87
1551	11.02	8 74	3.71	12 45	.68			12.08
	11 13	**9 16**	**4.09**	**13 26**	**.56**			**12 85**
		10.00	*2 00*	*12 00*				*11.80*
1380	3.81						12.70	12.70
							12 00	*12.00*
1439	11.68	6.82	2.68	9.50	.82	1.34	2.20	15.12
1536	18 71	7 80	1.99	9.79	.72	1.35	1 93	15 23
1552	12.33	7 16	2.07	9 23	1 02	1.69	1.52	15 19
1567	12 21	6 91	3.13	10.04	.55	1.55	1.95	15 94
	13 73	**7 17**	**2 47**	**9.64**	**.78**	**1 48**	**1.90**	**15 37**
		7.00	*2.00*	*9.00*	*50*	*1.50*	*2.00*	*14 93*
1475	14.47	7 04	2 51	9 55	.64	1 70	2 33	16.30
1332	13 53	6.41	3 43	9.84	.32	1.62	2.27	16.22
1366	12 76	6 26	3.52	9 78	.49	1 60	2 27	16.10
1411	11 57	7 07	1.98	9 05	.63	1 51	1 87	14 87
1364	11 79	5.99	3 04	9.03	.14	1 42	2.52	15.15
1454	13.69	6 75	1.91	8 66	.55	1 45	2 27	14 73
1537	11.69	6.75	2.37	9.12	.81	1 52	2.10	15.16
1553	12 08	7 88	1.56	9 44	1.56	1 43	1 67	14.89
1568	15.36	6 55	2.84	9 39	75	1 79	1.92	15 95
1616	10 50	6 32	2.23	8.55	.67	1 46	2 25	14 59
1617	12 33	7.38	2 60	9.98	.49	1 42	2.69	16.32
1618	12 55	7 15	2 06	9.21	1.38	1 50	1.63	14 76
	12 69	**6 79**	**2 50**	**9 30**	**.70**	**1 54**	**2 15**	**15 42**
		7.00	*2.00*	*9 00*	*.50*	*1.50*	*2.00*	*14 93*
1436	9 98	5 17	2 10	7.27	.42	2 42	6.14	19.86
		6 00	*2 00*	*8.00*	*.50*	*2.25*	*3.50*	*17 49*
1417	13 15	6 26	2 29	8 55	.35	1 46	2 49	14.83
		7.00	*2 00*	*9.00*	*50*	*1 50*	*2.00*	*14.93*
1327	12 92	5 97	2.56	8.53	36	1 59	2 26	14.91
1423	11 85	7.06	2 52	9 58	.45	1 43	1.70	14.96
1514	11 40	6 60	2 18	8 78	.58	1.50	2 35	15 04
1538	10 85	7.07	2.24	9 31	.56	1..51	3.08	16 32
	11 76	**6.68**	**2 38**	**9 05**	**.49**	**1 51**	**2.35**	**15 31**
		7 00	*2.00*	*9.00*	*.50*	*1 50*	*2.00*	*14 93*
1496	12 78	10.06	3 49	13.55	1 22			13.20
		11.00	*2.00*	*13.00*	*1.00*			*12.80*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	EAGLE COTTON OIL CO., Meridian, Miss.	
1479	Eagle H. G. Acid Phos...	Eagle Cotton Oil Co., Meridian.....
1573	Eagle H. G. Acid Phos...	J. F. Oneal, Perkinston.....
		Average .....
		Guarantee ....
	THE GOULDING FERTILIZER CO., L'TD. Pensacola, Fla.	
1497	Goulding's H. G. Acid Ph.	D. D. Richardson, Columbus .....
		Guarantee .....
	JACKSON FERTILIZER CO. Jackson, Miss.	
1335	H. G. Acid Phosphate....	Lotterhos & Huber, Crystal Spr'gs..
1425	H. G. Acid Phosphate....	T. M. Steele, Forest.....
		Average .....
		Guarantee .....
1409	Royal C.....	Abney & Travis, Heidelberg.....
1382	Royal C	E. Atkinson, Summit.....
1477	Royal C	Barney, Johns & Co., Gloster.....
1368	Royal C	W. H. Chambliss, Newton.....
1334	Royal C	Lotterhos & Huber, Crystal Spr'gs..
1488	Royal C.....	J. P. Myer, Ellisville. .....
1350	Royal C	J. M. Stephenson, Morton.....
1539	Royal C.....	C. A. Busick, Brandon.....
1554	Royal C	A. C. Seavey, Brookhaven.....
1613	Royal C.....	Peets-Norman Co., Hazlehurst.....
1614	Royal C..... ..	A. D. J. Smith, Centerville... ....
1615	Royal C.....	M. D. Graham, Forest.....
		Average .....
		Guarantee .....
1489	Lotterhos & Huber's Tomato Grower.....	Lotterhos & Huber, Crystal Spr'gs.
		Guarantee .....
1381	German Kainit.....	Lotterhos & Huber, Crystal Spr'gs.
		Guarantee .....
1422	Our Veg. Special Royal C	Lotterhos & Huber, Crystal Spr'gs.
		Guarantee .....
1438	Vegetable and Fruit Fert.	Lotterhos & Huber, Crystal Spr'gs.
		Guarantee .....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value per ton.
		Water—soluble.	Citrite—soluble.	Available.	Insoluble.			
1479	13.53	11.64	4 47	16.11	2 29			15.66
1573	12.98	12 35	5.37	17.72	.70			17 18
	13 26	**12 00**	**4 92**	**16 92**	**1 50**			**16 42**
		11.00	*4 00*	*15 00*				*14 60*
1497	11.65	11.91	3.09	15 00	3.43			14.69
		12.00	*3.00*	*15 00*	*1.00*			*14.70*
1335	15.00	13.41	1 68	15.09	2.01			14.92
1425	12.22	11 44	2.36	13.80	1.18			13.56
	13 61	**12 43**	**2.02**	**14 45**	**1.60**			**14 24**
		10.00	*2.00*	*12.00*	*1.00*			*11.80*
1409	18.54	6.35	2.29	8.64	1.20	1.74	1.84	15.04
1382	19.03	7 51	2.95	10.46	.42	1.61	1.80	16 39
1477	12.02	7.46	1.53	8.99	3.33	1.68	2 00	15 46
1368	19.34	6.45	2.00	8.45	1.41	1.77	1.85	14.97
1334	19.53	7.15	3.39	10.54	.27	1 56	1.76	16 25
1488	11.95	6.52	2.79	9.31	1.59	1 79	2 06	16.01
1350	12.53	7 47	3 10	10.57	.28	1.53	1.93	16.40
1539	15.00	6.72	3.14	9 86	.81	1 70	1.83	16 05
1554	11.15	7 57	2.08	9 65	1.28	1.70	1.88	16 00
1613	12 09	7 10	2 27	9.37	2.64	1 72	1.91	15 78
1614	11.37	6 78	1.92	8 70	3.03	1 86	1 88	15.50
1615	10.81	7.32	2.32	9.64	1.60	1.78	1.81	16 11
	14 45	**7 03**	**2 48**	**9.51**	**1 49**	**1 70**	**1.88**	**15 83**
		6.00	*1.60*	*7 60*	*1 00*	*1.55*	*1.80*	*13.50*
1489	12.32	7.20	3.12	10.32	.65	2.50	2.76	19.64
		6.00	*4.00*	*10 00*	*1.00*	*2.40*	*2.67*	18.87
1381	3.65						12.16	*12* 16
							12.00	*12.00*
1422	14.06	6.88	2.84	9.72	.75	1.77	6.24	20.54
		6.00	*1 60*	*7.60*	*1.00*	*1.65*	*6.00*	*17.98*
1438	16.10	4.75	2.04	6.79	.63	3 46	4.66	20.76
		3.00	*3.00*	*6 00*	*1 00*	*3.00*	*4.00*	*17.95*

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	SOLD BY MARBACH & EAGAN, Crystal Springs, Miss.	
1421	Bat Guano	Lotterhoss & Huber, Crystal Spr'gs.
1621	Bat Guano	W. S. Howard & Co., Hazlehurst
		Average
		Guarantee
	MERIDIAN FER. FACTORY Meridian, Miss.	
1415	Meridian So. Acid Phos'te	P. E. Briley & Co., Magnolia
1370	Meridian So. Acid Phos'te	T. C. Edwards, Shuqualak
1352	Meridian So. Acid Phos'te	W. B. Richardson, Newton
1383	Meridian So. Acid Phos'te	Story & Smythe, Forest
1530	Meridian So. Acid Phos'te	L. R. Davis, Iuka
		Average
		Guarantee
1456	Meridian Home Mixture	A. E. Dalrymple, Amory
1431	Meridian Home Mixture	T C. Edwards, Shuqualak
1353	Meridian Home Mixture	W. H. Gallaspy, Hickory
1491	Meridian Home Mixture	NcLeod & Co., Purvis
1329	Meridian Home Mixture	J. NcGrath & Sons, Brookhaven
1347	Meridian Home Mixture	Stokes-Evans Hardware Co., Macon.
1483	Meridian Home Mixture	Thomas E. Winn, Enterprise
1336	Meridian Home Mixture	J. P Wise & Co., Hazlehurst
1516	Meridian Home Mixture	Mathis & Cates, Corinth
1594	Meridian Home Mixture	Lann-Carter Hard'e Co. Aberdeen.
1601	Meridian Home Mixture	Robinson Mer. Co., Centerville
1602	Meridian Home Mixture	Story & Smythe, Forest
1603	Meridian Home Mixture	J. M. Alexander, Kosciusko
1604	Meridian Home Mixture	Holloway, McRaney & Co., Williamsburg Depot
		Average
		Guarantee
1490	Meridian Blood and Bone	C. P. McGeehee, Gloster
1344	Meridian Blood and Bone	Meridian Fer. Factory, Meridian
1351	Meridian Blood and Bone	Story & Smythe, Forest
		Average
		Guarantee
1443	German Kainit	A. Roberts & Co., Lauderdale
		Guarantee
1470	Meridian Soluble Guano	P. E. Briley & Co, Magnolia
1414	Meridian Soluble Guano.	J. W. Elliott, Magnolia
1555	Meridian Soluble Guano	J. D. Granberry, Hazlehurst

Laboratory Number.	Moisture—Per cent.	Phosphoric Acid—Per Cent..				Nitrogen—Per cent.	Potash—Per cent.	Relative value per ton.
		Water—soluble.	Citrite—soluble.	Available.	Insoluble.			
1421	18 09				11.38	4.64	.79	20.38
1621	21.80				10 47	5.00	.78	20 81
	19 95				**10 93**	**4.82**	**.79**	**20 59**
					5 00	*4.25*	*.65*	*15 33*
1415	13.60	11.90	5.47	17.37	1.13			16.82
1370	11.52	11.04	5.24	16 28	.93			15.76
1352	12.72	10 35	5 23	15.58	1.13			15.06
1383	10.49	10 38	5 09	15.47	1.28			14.96
1530	16 07	12.42	2.99	15 41	1 38			15.11
	12.88	**11 22**	**4 80**	**16 02**	**1 17**			**15 54**
		12.00	*2 00*	*14.00*	*1 00*			13 80
1456	13.07	7.70	2 58	10.28	1.27	1.93	2.17	17 50
1431	12.37	7.42	2 96	10.38	.91	1 75	1.93	16 83
1353	12.29	6 27	3.54	9 81	.64	2.01	2 28	17 26
1491	15 88	7 54	3.17	10 71	.56	2.00	2 52	18.41
1329	13.19	7.02	3 82	10 84	.64	1.75	1.71	16 98
1347	12.15	6.91	3.50	10.41	.81	1.67	2 13	16 78
1483	14.79	8..01	3.14	11.15	.83	1 80	1.85	17 64
1336	11 87	6 73	3 60	10 33	.90	1.73	1 96	16.69
1516	13.63	7.79	2 01	9.80	1.80	1.82	2.19	16 79
1594	12.33	7.91	2.53	10.44	1 62	1.89	1.22	16 60
1601	15.76	5 85	2 51	8.36	1.02	2 07	1.95	15.75
1602	10 95	5.51	4.42	9 93	1.47	1.86	2 30	16.90
1603	12.47	7 82	3.49	11 31	.86	1.83	2.00	17 99
1604	11 60	6.83	2 07	8 90	1.57	2.27	2 21	17 15
	13.02	**7 09**	**3.10**	**10.19**	**1.06**	**1.88**	**2 03**	**17.09**
		7.75	*2.00*	*9.75*	*1.00*	*1.75*	*1.85*	*16.21*
1490	18.36	7 62	3 78	11 40	1.02	1.45	1.27	16 29
1344	14.16	6 83	3 02	9.85	.82	1.90	1.74	16 51
1351	15.81	7.73	3 40	11 13	1.38	1.45	1.63	16 41
	16.11	**7 40**	**3.40**	**10 79**	**1 07**	**1 60**	**1 55**	**16.40**
		7.75	*2.00*	*9.75*	*2 00*	*1.75*	*1.85*	*16 21*
1443	6.90						12 32	12 32
							12.00	*12.00*
1470	12.14	7.42	3.11	10.53	1.11	1.86	2.22	17 55
1414	13 36	6.45	3.06	9 51	.65	1.74	2.26	16.25
1555	12.86	7 39	2.76	10 15	1 83	1.78	1 96	16 73

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
		Average
		Guarantee
1420	Meridian Veg. Grower	J. L. Miller, Gallman
1540	Meridian Veg. Grower	J. L. Miller, Gallman
1593	Meridian Veg. Grower	Jesse Byrd, State Line
		Average
		Guarantee
1515	Meridian Farmer's Friend	A. E. Dalrymple, Amory
		Guarantee
	MOBILE PHOSPHATE AND CHEMICAL CO., Mobile, Ala.	
1343	English Acid Phosphate	Winner & Meyer, Meridian
1517	English Acid Phosphate	Dr. C. C. Ewing, Aberdeen
		Average
		Guarantee
1467	Eclipse Sol. Guano	Grunewald & Loewenberg, McCool
		Guarantee
1474	I. X. L. Acid Phosphate	Hawkins & Co., Hattiesburg
1349	I. X. L. Acid Phosphate	W. J. Hubbard, Shuqualak
1498	I. X. L. Acid Phosphate	D. D. Richardson, Columbus
1342	I. X. L. Acid Phosphate	Winner & Meyer, Meridian
1406	I. X. L. Acid Phosphate	Winner & Meyer, Meridian
		Average
		Guarantee
1432	K. K. K. Sol. Am Bone	J. L. Moyse & Bros., Summit
1518	K. K. K. Sol. Am. Bone	Gilmore & May, Amory
1586	K. K. K. Sol. Am. Bone	J. L. Moyse & Bro., Summit
		Average
		Guarantee
1407	Mobile Standard	Wm. Atkinson & McDonald, Wesson
1348	" "	W. J. Hubbard, Shuqualak
1459	" "	Barnett-Davis Sup'ly Co., Booneville
1341	" "	Winner & Meyer, Meridian
1481	" "	G. W. Fail, Buckatunna
1531	" "	D. D. Richardson, Columbus
1542	" "	G. C. Rew, Forest
1569	" "	W. J. Hubbard, Shuqualak
1589	" "	Mathis & Cates, Corinth
1610	" "	Gilmore & May, Amory
1611	" "	Miss. & Ala. Coop'tve Co., State Line

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value per ton.
		Water—Soluble.	Citrite—Soluble.	Available.	Insoluble.			
	12 79	**7 09**	**2 98**	**10 06**	**1 20**	**1 79**	**2 14**	**16 84**
		7 75	*2 00*	*9 75*	*1 00*	*1 75*	*1 85*	*16 21*
1420	11 75	4 41	1 47	5 88	1 00	2 62	4 60	17 54
1540	10 48	6 23	1 04	7 27	.96	2 72	5 09	19 74
1593	13 23	6 09	1 52	7 61	2 67	3 59	4 15	21 48
	11 82	**5 58**	**1 34**	**6 92**	**1 54**	**2 98**	**4 61**	**19 59**
		4 00	*2 00*	*6 00*	*1 00*	*2 50*	*4 00*	*16 68*
1515	12 76	7 19	2 34	9 53	1 04	1 95	2 23	16 89
		7 50	*1 50*	*9 00*	*1 00*	*1 25*	*2 00*	*14 29*
1343	15 27	9 52	3 38	12 90	1 60			12 56
1517	16 07	8 07	3 66	11 73	2 69			11 36
	15 67	**8 80**	**3 52**	**12 32**	**2 15**			**11 96**
		12 00	*2 00*	*14 00*	*2 00*			*13 80*
1467	11 54	7 05	2 79	9 84	1 25	2 06	2 36	17 59
		6 00	*2 00*	*8 00*	*1 50*	*1 65*	*2 00*	*14 34*
1474	13 78	7 48	4 59	12 07	2 48			11 61
1349	16 24	9 44	2 89	12 33	2 19			12 04
1498	13 03	9 63	4 86	14 49	1 91			14 00
1342	16 66	9 29	3 56	12 85	1 50			12 49
1406	16 25	8 74	2 92	11 66	2 38			11 37
	15 19	**8 92**	**3 76**	**12 68**	**2 09**			**12 30**
		10 00	*2 00*	*12 00*	*2 00*			*11 80*
1432	14 54	7 14	3 37	10 51	2 17	.70	.96	13 06
1518	12 29	8 33	3 32	11 65	2 25	.94	.94	14 84
1586	8 46	8 09	3 59	11 68	3 24	.72	1 07	14 37
	11 76	**7 85**	**3 43**	**11 28**	**2 55**	**.79**	**.99**	**14 09**
		8 75	*1 25*	*10 00*	*1 50*	*.85*	*1 00*	*13 21*
1407	11 30	6 19	3 85	10 04	.87	1 76	1 83	16 33
1348	12 37	5 96	3 25	9 21	1 38	1 70	1 89	15 45
1459	14 68	7 19	2 42	9 61	2 10	1 76	1 74	15 95
1341	12 38	6 46	3 54	10 00	1 36	1 82	1 87	16 52
1481	14 00	6 32	2 34	8 66	1 87	1 98	2 49	16 36
1531	11 33	7 06	3 60	10 66	1 79	1 54	1 43	15 97
1542	11 60	6 73	3 26	9 99	1 42	1 53	1 72	15 59
1569	12 05	6 01	2 64	8 65	3 49	1 79	2 24	15 55
1589	10 86	5 45	2 78	8 23	4 26	1 62	1 84	14 25
1610	11 17	6 58	3 40	9 98	2 66	1 68	1 57	15 83
1611	11 89	5 30	3 22	8 52	6 10	1 52	1 56	13 94

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
1612	Mobile Standard	Dr. C. C. Ewing, Aberdeen
		Average
		Guarantee
1541	Kainit	G. C. Rew, Forest
		Guarantee
	NEW ORLEANS ACID AND FERTILIZER CO., New Orleans, La.	
1331	Black Diamond Acid Phos	Louis Cohn & Bros., Brookhaven
1419	Black Diamond Acid Phos	W. S. Howard & Co., Hazlehurst
1346	Black Diamond Acid Phos	D. Rosenbaum's Sons, Meridian
1556	Black Diamond Acid Phos	Wilkinson & Rawls, Poplarville
		Average
		Guarantee
1365	Blood, Bone and Potash	S. Cohn & Son, Magnolia
1362	Blood, Bone and Potash	T. L. Cotton, Summit
1543	Blood, Bone and Potash	P. H. Trawick, Gallman
		Average
		Guarantee
1434	Crescent City Acid Phosp	Bonner Bros., Sandersville
1326	Crescent City Acid Phosp	Lampton Mer. Co., Magnolia
1484	Crescent City Acid Phosp	N. P. Welborn & Co., Laurel
		Average
		Guarantee
1416	Dissolved Bone and Potash	Louis Bendat, McComb City
1437	Dissolved Bone and Potash	W. S. Howard & Co., Hazlehurst
1550	Dissolved Bone and Potash	M. J. L. Hoye's Sons, Newton
		Average
		Guarantee
1363	Dixie Sol. Bone with Am. and Potash	Earns & Dale, Wesson
1424	Dixie Sol. Bone with Am. and Potash	Howie Bros., Morton
1519	Dixie Sol Bone with Am. and Potash	G. Lowenberg & Co., Kosciusko
		Average
		Guarantee
1557	Dissolved Bone	Hyman Mercantile Co., Summit
		Guarantee
1486	Gold Dust	J. M. Phillips, Williamsburg Depot
1355	Gold Dust	Turner & Taylor, Hattiesburg
1441	Gold Dust	G. S. Weems, Shubuta
1558	Gold Dust	G. H. Rankin, Columbia

Laboratory Number.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative value per ton.
		Water-soluble.	Citrate-soluble.	Available.	Insoluble.			
1612	11 08	5 46	2 43	7.89	4.75	1.63	2 13	14.26
	12.06	**6 23**	**3 06**	**9.29**	**2 68**	**1 69**	**1 86**	**15 50**
		6.00	*2.00*	*8 00*	*1.50*	*1.65*	*2 00*	*14.34*
1541	5.09						12.58	12.58
							12.00	*12.00*
1331	16.39	12.37	3.17	15.54	.70			15.22
1419	14 22	9.97	4.45	14.42	.83			13.98
1346	15.22	10.17	3.34	13.51	1.25			13.18
1556	16.79	9.77	4.24	14.01	2 85			13.59
	15 65	**10 57**	**3 80**	**14 37**	**1.41**			**13 99**
		10.00	*2.00*	*12.00*	*2.00*			*11.80*
1365	6.74	7.59	2.44	10 03	5.36	1.69	1.49	15.92
1362	10.66	6.91	2 41	9.32	5 33	1 67	1.49	15.16
1543	14.72	6 68	2 13	8.81	4 75	1.77	1.17	14.63
	10.71	**7 06**	**2.33**	**9 39**	**5 15**	**1 71**	**1 38**	**15.24**
		7.00	*1.50*	*8.50*	*2.00*	*1.65*	*1.00*	*13.89*
1434	13 58	10.02	4.07	14.09	1.00			13.68
1326	14 98	10 99	4 26	15.25	1.33			14.82
1484	14 75	11.37	4.58	15.95	1 89			15.49
	14 44	**10.79**	**4 30**	**15 09**	**1 41**			**14 66**
		10.00	*2.00*	*12.00*	*2.00*			*11 80*
1416	15.39	8.79	3 73	12.52	.68		2.87	15.01
1437	14.48	8.15	3 63	11.78	.78		3 13	14.55
1550	16 25	10.20	4 25	14 45	.84		2.28	16.31
	15 37	**9 05**	**3.87**	**12.92**	**.77**		**2 76**	**15 29**
		8.00	*2.00*	*10 00*	*2 00*		*2.00*	*11 80*
1363	11.35	8.06	2.64	10.70	1.50	.78	1.84	4.42
1424	12.51	8 23	2.56	10 79	.82	.98	1.82	15.05
1519	17 79	5.86	3.92	9 78	.67	.93	1 12	13.07
	13 88	**7 38**	**3 04**	**10 42**	**1 00**	**.90**	**1 59**	**14 18**
		7.00	*2.00*	*9.00*	*2.00*	*.85*	*1.00*	*12.14*
1557	13.38	12 15	2.75	14.96	3 59			14.63
		12 00	*3.00*	*15 00*	*2.00*			*14 70*
1486	15 68	7.32	2.00	9 32	1 04	1.45	1.64	14 75
1355	12.23	7.54	2.86	10 40	.92	1.40	1.73	15 69
1441	14.45	6.79	2 54	9 33	1.32	1.41	1 50	14.45
1558	17.18	6 27	3.01	9.28	2 25	1.79	1.49	15.39

Laboratory Number	Name of Brand and Manufacturer.	Where and From Whom Collected.
1619	Gold Dust	Sandersville Mer. Co., Sandersville
		Average
		Guarantee
1359	Goldsmith's Imp. Mixture.	W. M. McGough & Sons, Morton
1391	Goldsmith's Imp. Mixture.	A. B. Wolf, Forest
1393	Goldsmith's Imp. Mixture	Louis Cohn & Bros., Brookhaven
1471	Goldsmith's Imp. Mixture.	Fernwood Lumber Co, Fernwood
1392	Goldsmith's Imp. Mixture.	Hawkins & Co., Hattiesburg
1492	Goldsmith's Imp. Mixture.	J. P. & W. C. Wetherlee, Waynesboro
1455	Goldsmith's Imp. Mixture.	G. S. Weems, Shubuta
1544	Goldsmith's Imp. Mixture	A. B. Wolfe, Forest
1572	Goldsmith's Imp. Mixture	J. P. & W. C. Weatherbee, Waynesboro
1591	Goldsmith's Imp. Mixture	Biloxi Milling Co., Biloxi
1597	Goldsmith's Imp. Mixture	A. E. Dalrymple, Amory
1598	Goldsmith's Imp. Mixture	H. C. Clark & Bro., Wiggins
1599	Goldsmith's Imp. Mixture	J. P. Myer, Ellisville
1600	Goldsmith's Imp. Mixture	B. F. Harris, State Line
		Average
		Guarantee
	PLANTERS FERTILIZER CO., New Orleans, La.	
1476	Cotton and Corn Fertilizer	J. D. Causey, Gloster
1559	Cotton and Corn Fertilizer	M. Rothchild & Bros., Woodville
		Average
		Guarantee
	STANDARD GUANO AND CHEMICAL CO., New Orleans, La.	
1358	Stern's English Acid Phos	Threefoot Bros. & Co., Meridian
		Guarantee
1435	Acid Phosphate	E. B. McLain, Gloster
1458	Acid Phosphate	Gilmore & May, Amory
1560	Acid Phosphate	T. N. Strahan, Poplarville
1620	Acid Phosphate	Lampton Mer. Co., Magnolia
1629	Acid Phosphate	N. P. Welborn & Co., Laurel
1630	Acid Phosphate	W. V. Thompson, Quitman
		Average
		Guarantee
1428	Blood, Bone and Meat	M. J. L. Hoye's Sons, Newton

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value per ton.
		Water—Soluble.	Citrite—Soluble.	Available.	Insoluble.			
1619	11.08	7 68	2.97	10.65	1 85	1 74	1 29	16 43
	14 12	**7.12**	**2 68**	**9 80**	**1.47**	**1 56**	**1 53**	**15 34**
		7 00	*1 50*	*8 50*	*2 00*	*1 65*	*1 00*	*13.89*
1359	10.64	7 82	2.62	10.44	1 02	1.56	1.87	16.34
1391	12 75	7.91	2.34	10.25	1 28	1 59	1 92	16.31
1393	10 97	6 90	3 57	10 47	1.04	1 70	1.97	16 76
1471	14 28	7 38	4 13	11 51	.59	1 65	1 26	16 84
1392	12.93	6 72	2 99	9.71	70	1.59	1 92	15 70
1491	17.18	8 61	3 07	11.68	1 29	1 58	1 24	16.96
1455	14 90	7.13	2 75	9.88	93	1.39	1.49	14 92
1544	16 84	8 25	1 69	9 94	2 39	1 68	1.58	15 97
1572	15.40	5 94	3 65	9 59	2 28	1.70	1 54	15.44
1591	20 79	4 50	3.15	7.65	1 05	1.94	1.70	14.37
1597	15 19	7 69	3 78	11 47	.74	1.47	1 31	16.44
1598	19 94	3 12	3.18	6.30	1.23	2 02	1 74	13 28
1599	18 16	7.42	2 70	10.12	1.56	1.87	1.98	16.97
1600	14.74	5 36	3 18	8.54	1 68	1 98	1 63	15 30
	15 34	**6 77**	**3 06**	**9 83**	**1 27**	**1 69**	**1 66**	**15 83**
		7.00	*1.50*	*8 50*	*2.00*	*1 65*	*1 00*	*13.89*
1476	9.93	5 78	1 84	7 62	1 78	2.47	1 93	16 16
1559	11 69	7 50	3 35	10.85	1.22	1 78	1.83	17 24
	10 81	**6 64**	**2 60**	**9.24**	**1 50**	**2.13**	**1 88**	**16 70**
		7.00		*1.00*		*2.50*	*2 00*	*15 88*
1358	11 97	11 97	6 23	18 20	.46			17.58
		13 00	*3 00*	*16.00*	*1 00*			*15.70*
1435	12 53	11.35	5.98	17.33	1.34			16 73
1458	13 54	12 1[illegible]	5.14	17 29	1 54			16.78
1560	12 41	11 65	3 59	15 22	3 84			14 86
1620	13 39	11 19	4 41	15 60	3 16			15 16
1629	15 82	12.11	6 24	18 35	.50			17.73
1630	15 07	11 33	5 73	17 06	72			16.49
	13 79	**11 63**	**5 18**	**16 81**	**1 85**			**16 29**
		13.00	*3 00*	*16.00*	*1.00*			*15.70*
1428	8.98	8 16	2.54	10 70	1 01	2.05	2.20	18.27

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
1361	Blood, Bone and Meat	Hyman Mercantile Co , Summit
1466	Blood, Bone and Meat	Seward & Fencher, McCool
		Average
		Guarantee
1412	Ground Bone	I. N. Varnado, Osyka
1545	Ground Bone	Lampton Mercantile Co., Magnolia
		Average
		Guarantee
1482	Champion Farmer's Choice	M. A. Hooge, Buckatunna
1413	Champion Farmer's Choice	L. M. Wolf, Osyka
1546	Champion Farmer's Choice	Wm Atkinson-Bacot Co., Osyka
1592	Champion Farmer's Choice	T. M. Heidelberg, Heidelberg
		Average
		Guarantee
1494	Mississippi Home Guano	R. W. Fagan & Co , Waynesboro
1356	Mississippi Home Guano	W. M. Conner, Hattiesburg
1478	Mississippi Home Guano.	Sandersville Mer. Co. Sandersville.
1410	Mississippi Home Guano	Wilkinson & Rawls, Poplarville
		Average
		Guarantee
1354	Stern's Am. R. B. Superphosphate	B. F. Fridge, Ellisville
1485	Stern's Am. R. B. Superphosphate	W. M. Hyde, Vossburg
1328	Stern's Am. R. B. Superphosphate	Hyman Mercantile Co., Summit
1472	Stern's Am. R B. Superphosphate	Hyman Mercantile Co., Summit
1369	Stern's Am. R. B. Superphosphate	McLeod & Kennedy, Hattiesburg
1493	Stern's Am. R. B. Superphosphate	James O'Connell, Purvis
1384	Stern's Am. R. B. Superphosphate	W. B. Richardson, Newton
1408	Stern's Am. R. B. Superphosphate	Sandersville Mer. Co., Sandersville.
1548	Stern's Am. R. B. Superphosphate	Wm. Atkinson Bacot Co., Osyka
1563	Stern's Am. R. B. Superphosphate	C. A. Crawford, Seminary
1605	Stern's Am. R. B. Superphosphate	R. T. Scherck, Brookhaven

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative value per cent.
		Water-soluble.	Citrate-soluble.	Available.	Insoluble.			
1361	11.67	5.08	3.23	8 31	1.69	2.45	1.87	16 59
1466	11.55	6 43	2 50	8 93	3.07	2.16	1.40	16.02
	10 73	**6 56**	**2 75**	**9 31**	**1 92**	**2.22**	**1 82**	**16 96**
		5 00	*3 25*	*8 25*	*1 00*	*1.70*	*1.50*	*14.10*
1412	5.71				18.42	3 07		17.65
1545	6 65				21.24	3 64		20 62
	6 18				**19.83**	**3.36**		**19 14**
					18.50	*3 00*		*17.50*
1482	12.93	7 07	3 07	10 14	1.41	1 64	1.79	16 13
1413	11.11	8.07	3 61	11 68	.81	1 47	1.48	16 84
1546	11.21	8 46	2.47	10.93	6.46	1.66	.96	16.21
1592	11.57	7.85	2.23	10 08	6 17	1.93	.90	16 07
	11.70	**7 86**	**2 85**	**10.71**	**3 71**	**1 68**	**1 28**	**16.32**
		5 00	*3 50*	*8 50*	*1.00*	*1.65*	*1 50*	*14 19*
1494	11.88	5.63	3 47	9.10	.65	1.81	1.33	15 06
1356	9 94	6 83	4.05	10.88	.65	1.63	1 53	16.49
1478	11 48	7 51	1 68	9 19	1.85	1.89	1 41	15.63
1410	11 60	8.70	3 42	12.12	.41	1.63	1.42	17 68
	11.23	**7 17**	**3 16**	**10 32**	**89**	**1 74**	**1 42**	**16.22**
		6 00	*3.00*	*9 00*	*1.00*	*1.65*	*1 50*	*14 74*
1354	6 93	3 52	4.61	8.13	2 72	1.93	1 53	14 51
1485	12.52	7.51	1.91	9 42	2.96	1.95	1.72	16 31
1328	14 84	3.89	4 67	8 56	1 43	1.35	1.50	13 31
1472	12 70	6 68	3.65	10 33	4.44	1.70	1.11	15.75
1369	14.20	4 45	3.79	8.24	1.15	1 73	1.60	14.22
1493	12 65	6 93	2 71	9.64	3 19	1.75	1.47	15.65
1384	11.27	6 59	2 25	8.84	4.43	1.87	1.57	15 33
1408	12.55	6.90	5.11	12.01	.52	1.90	1.59	18 32
1548	14.54	6 79	3.02	9.81	6.55	1.73	.94	15.21
1563	11 60	5.19	3 40	8.59	6 00	1.57	1.33	13 90
1605	11 39	6.23	3 61	9.84	5.50	1.48	1 12	14 66

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
1606	Stern's Am. R. B. Superphosphate	Wilkinson & Rawls, Poplarville
1607	Stern's Am. R. B. Superphosphate	Lampton Mer. Company, Magnolia
1608	Stern's Am. R. B. Superphosphate	Kennedy & Co., Wiggins
1609	Stern's Am. R. B. Superphosphate	W. V. Thompson, Quitman
		Average
		Guarantee
1547	Pelican R. B. Guano	Wm. Atkinson-Bacot Co., Osyka
1561	Pelican R. B. Guano	Wm. Atkinson-Foxworth Co., Columbia
		Average
		Guarantee
1562	Kainit	Hyman Mercantile Co., Summit
		Guarantee
	TENNESSEE CHEMICAL COMPANY. Nashville, Tenn.	
1433	Ox Bone with Am. and Potash	Stokes-Evans Hardware Co., Macon
1520	Ox Bone with Am. and Potash	A. E. Dalrymple, Amory
1590	Ox Bone with Am. and Potash	S. L. Sanders, Corinth
1595	Ox Bone with Am. and Potash	Dr. C. C. Ewing, Aberdeen
		Average
		Guarantee
1465	Ox H. G. Dissolved Bone	D. O. Matthews, Iuka
1426	Ox H. G. Dissolved Bone	W. B. Richardson, Newton
1521	Ox H. G. Dissolved Bone	Dr. C. C. Ewing, Aberdeen
1532	Ox H. G. Dissolved Bone	L. L. Anderson, Shuqualak
		Average
		Guarantee
1487	Ox Cotton Guano	Myer & Egger, Columbus
1522	Ox Cotton Guano	A. E. Dalrymple, Amory
		Average
		Guarantee
1469	Ox Bone and Potash	W. B. Potts Co., Kosciusko
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative value per ton.
		Water-soluble.	Citrate-soluble.	Available.	Insoluble.			
1606	11 72	6.77	3 18	9.95	3.45	1.71	1 23	15.57
1607	11 88	6.20	3.30	9.50	5.86	1.57	.90	14.39
1608	12 63	6 58	3 09	9.67	4.40	1.68	1.14	15.12
1609	12 32	6 41	4.10	10 51	3 54	1.44	1.41	15.47
	12.25	**6 04**	**3 49**	**9 54**	**3 74**	**1 69**	**1 34**	**15 18**
		5.00	*3.50*	*8.50*	*1.00*	*1.65*	*1.50*	*14.19*
1547	12 95	6 42	3 07	9.49	5.44	1 60	.97	14.55
1561	11.40	6 33	2.80	9 13	5 85	1.64	.95	14.31
	12.18	**6.38**	**2 93**	**9.31**	**5 65**	**1 62**	**96**	**14 43**
		4.00	*4 00*	*8 00*	*1 00*	*1.65*	1.50	*13.64*
							12.52	12 52
1562	4 10						*12.00*	*12.00*
1433	9 73	8.26	4 00	12.26	1.09	1.01	1 39	16.03
1520	10.29	7.27	4.03	11 30	1 43	1.09	1.03	14 92
1590	11.88	7.00	3 70	10.70	2.38	1.05	.97	14.19
1595	11.71	8 24	3.58	11.82	1.43	.89	.98	14.89
	10 90	**7 69**	**3.83**	**11.52**	**1 58**	**1 01**	**1.09**	**15.01**
		8 00	*2 00*	*10.00*	*1 00*	*.85*	*1.00*	*13.14*
1465	11.79	9.97	3.91	13.88	1.85			13.49
1426	12 55	10.16	3 10	13.26	1.64			12.95
1521	13.63	11 03	3 88	14.91	1.61			14.52
1532	11.40	11.32	3.15	14.47	1.34			14 16
	12 34	**10 62**	**3 51**	**14.13**	**1.61**			**13.78**
		12.00	*2.00*	*14 00*	*1.00*			*13.80*
1487	11 30	7.46	3 62	11.08	1.43	1 59	1.22	16.31
1522	9.98	7.55	3.95	11 50	1.60	1.84	1.13	17.30
	10 64	**7.50**	**3 79**	**11 29**	**1.51**	**1.72**	**1.17**	**16.81**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*1.00*	*16.34*
							.93	12.54
1469	12.24	6.93	5.20	12.13	1 06		*1.00*	*12.80*
		10.00	*2.00*	*12.00*	*1.00*			

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	TENNESSEE VALLEY FERTILIZER COMPANY. Florence, Ala.	
1596	King Cotton Grower.....	J. J. Rogers & Sons, Tupelo.... ...
		Guarantee ....
1523	Acid Phosphate	W. W. Harris, Iuka.....
		Guarantee .....
	SOLD BY THREEFOOT BROS. & CO,, Meridian, Miss.	
1442	Threefoot's H. G. English Acid Phosphate.....	Threefoot Bros. & Co., Meridian..
		Guarantee ... .
1495	Threefoot's Imp Mixture	S. J. Taylor, Enterprise. .. ....
1338	Threefoot's Imp. Mixture	Threefoot Bros. & Co., Meridian
1440	Threefoot's Imp. Mixture	J. L. Wells, Hickory. .. ..
		Average ....
		Guarantee ....

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative value per ton.
		Water-soluble.	Citrate-soluble.	Available.	Insoluble.			
1596	11.47	5.35	2 84	8 19	5 20	1 38	1.17	12 87
		6 35	*3 65*	*10.00*	*1.00*		*1.00*	*13 39*
1523	11 02	6 27	3 86	10 13	7 86			9 74
		7.35	*5.65*	*13 00*				*13 44*
1442	14 69	12 23	5 38	17 61	.61			17.07
		13.00	*3.00*	*16 00*				*15.70*
1495	13 15	7 34	2 72	10 06	1.05	2 00	2.27	17 56
1338	12 70	6.83	3 35	10.18	86	1.92	2 04	17.17
1440	12 15	7 22	3.48	10 70	81	2.03	1 78	17 71
	12 67	**7.13**	**3.18**	**10 31**	**91**	**1 98**	**2.03**	**17.48**
		8 00	*2.00*	*10.00*	*1 00*	*1.75*	*1.85*	*16.46*

ANALYSES

—OF—

FERTILIZERS

ON SALE IN MISSISSIPPI.

FOURTH MONTHLY EDITION,

INCLUDING

ALL ANALYSES FOR SEASON 1899-1900.

These bulletins will be sent free to any address upon application to State Chemist.

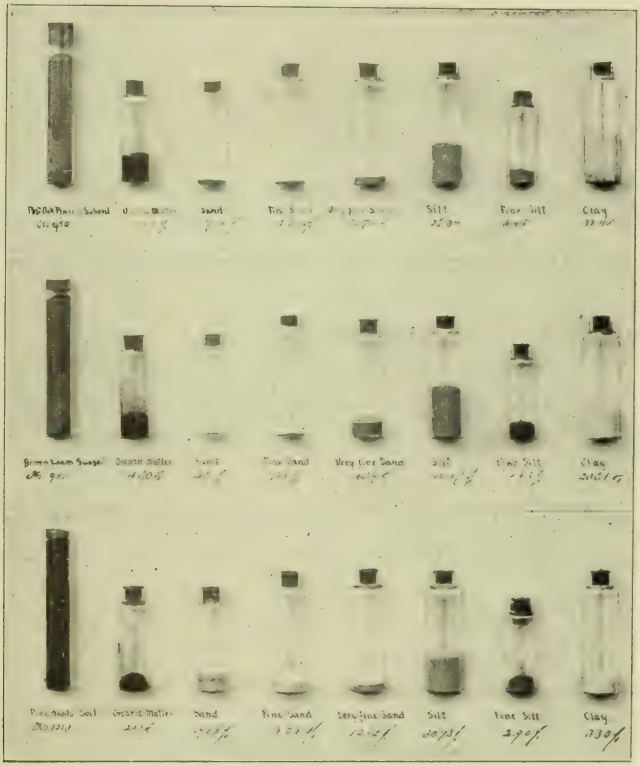
Mississippi Agricultural Experiment Station.

Bulletin No. 65.

SOILS OF MISSISSIPPI:

CHEMICAL AND PHYSICAL COMPOSITION.

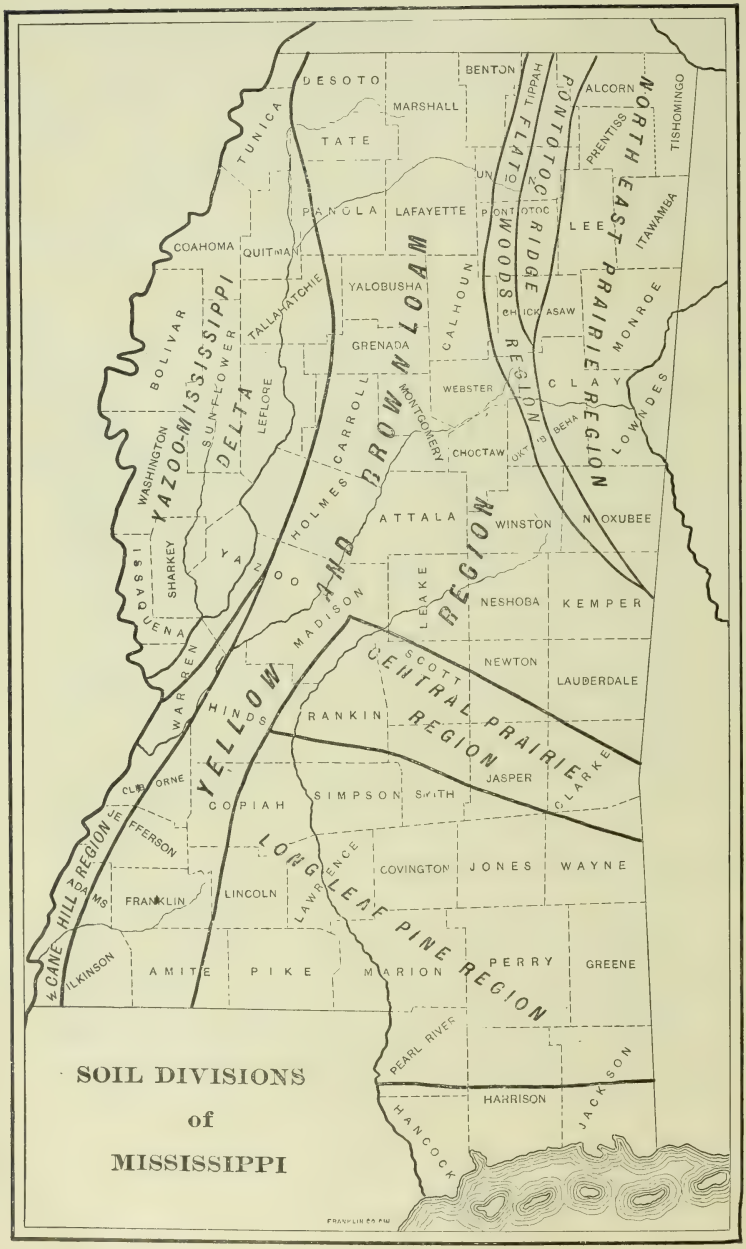
BY
W. L. HUTCHINSON, W. R. PERKINS AND E. B. FORRIS



PHYSICAL COMPOSITION OF THREE TYPICAL SOILS.

AGRICULTURAL COLLEGE, MISS.
JUNE, 1900.

MERIDIAN NEWS PRINT.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WEBSTER
CLAY
WASHINGTON
SUNFLOWER
LEFLORE
CHOCTAW
LOWNDES
HOLMES
CARROLL
MONTGOMERY
ATTALA
WINSTON
NOXUBEE
ISSAQUENA
SHARKEY
YAZOO
MADISON
LEAKE
NESHOBA
KEMPER
WARREN
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NEWTON
LAUDERDALE
RANKIN
JASPER
CLARKE
CLAIBORNE
COPIAH
SIMPSON
SMITH
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MARION
PERRY
GREENE
PEARL RIVER
HARRISON
JACKSON
HANCOCK
YAZOO-MISSISSIPPI DELTA
NORTH EAST PRAIRIE REGION
FLATWOODS REGION
LONG LEAF PINE REGION
CANE HILL REGION
SOIL DIVISIONS
of
MISSISSIPPI

SOILS OF MISSISSIPPI:

CHEMICAL AND PHYSICAL COMPOSITION.

Introduction.—How to maintain lands in a high degree of productiveness and how best to improve those that are depleted and worn, are the important soil problems in this State, and a study of these subjects is one of the principal lines of work being pursued by the Station. We desired to obtain all the valuable information we could concerning the different soils of the State, and the first thing we did was to take a hack and go and see the different lands, how they were tilled and managed and the approximate yield of crops. As we traveled we collected samples of representative soils for analysis, and the analytical results are reported in this bulletin. The data given in the tables, together with the map, which shows the location and extent of the different soil areas, will, we hope, furnish full and satisfactory information concerning all samples.

Washing or erosion.—The heavy rains, which occur all over the cotton belt, together with the system of farming pursued, have resulted in an abnormal and unusual washing of the hill lands in this section. In this State the original surface soil, or virgin soil, of the hills, has been largely washed down into the valleys, so that the soil now tilled, in the valleys, was formerly hill soil, and the soil now tilled on the hills was formerly subsoil. On the College farm the original surface soil of the valleys is covered from one to four feet deep with washings from the hills. In some sections of the State the washing of the surface of the hills into the valleys has been much greater than here, and in other sections, less. As a rule the valley lands are very productive, even when the analysis shows comparatively small amounts of plant food ingredients. The reason is apparent. They are made, to quite a depth, of material that was once productive, surface soil, and, when prop-

erly drained, the water conditions are good. Plants root deep in these soils.

Uplands.—As before stated, the tendency, in the cotton section, has been for the original surface soil of the hills to wash down

FIG. 1.—Small stalks show relative productiveness of soil (formerly subsoil) with only two years' exposure.

to lower levels. In many places the entire surface soil and even the upper subsoil have been washed away, and this wholesale erosion of the surface, varying in degree, gives for the existing surface soils very different periods of exposure as such. It matters not how rich they may be in plant food, subsoils are not productive when first exposed at the surface. The influence of these facts on the productiveness of our uplands is manifest in the "spotted" or irregular crop-yields on every cultivated hillside in the cotton belt.

Prairie soils.—The prairie lands in the State contain com-

paratively large amounts of clay, lime and humus, which determine their texture. As a rule they are rich in potash and phosphoric acid, though there are small areas that do not contain large amounts of these substances. Commercial fertilizers are not used on these lands. They have been tried, and do not pay. Melilotus, cowpeas and clover help these lands very much, where they have become unproductive by many years of cotton culture and improper tillage.

Brown-loam soils.—The soils of the brown-loam region generally have a very desirable texture, due to a large amount of

FIG. 2.—Small stalks show effect of poor water conditions. Soils from which two samples were taken were equally fertile.

silt. Their content of phosphoric acid is small, but the supply of potash seems ample. These soils were once very productive. Except in the extreme southern part of this area, farmers are just be-

ginning to use commercial fertilizers on these lands. At a depth of from two to twenty feet this section is underlaid by sand and gravel, and some parts of it are the worst washed lands in the State. Cowpeas, clovers and superphosphates improve the worn lands of this section.

Sandy and sandy-loam soils.—The soils of the long-leaf pine region are of a sandy or sandy-loam character with a clay or sandy-clay sub-soil. Comparatively they contain but a small amount of phosphoric acid, and farmers habitually use commercial fertilizers on all these lands. The fertilizers used consist mainly of superphosphates with a small amount of nitrogen and potash. Some fertilizer tests, made in this section, indicated that potash was not needed on these lands for the crops usually grown. We have never seen soils respond so well to cowpeas and superphosphates as do the light loamy soils of this section.

Determining factors.—Plants must have food and they must have water. Either phosphoric acid, potash or nitrogen may determine the crop yield. The yield may be determined by the supply of water in the soil. Hurtful or poisonous substances or excessive quantities of otherwise harmless substances may determine the yield. By determining the water supply, seasons and tillage may determine the yield, and the yield may also be determined by the use of fertilizers or plant food. It is desirable to have deep surface soils; former subsoils, recently exposed at the surface, are not desirable because they are not productive. In this State nitrogen, phosphoric acid and water are generally the determining factors in the production of crops.

Lime and organic matter.—Both lime and organic matter tend to change the texture of a soil and doubtless to increase its productiveness, but for improving the soils of this State, organic matter seems to be much more economical and efficient. Organic matter helps the water supply and the food supply; the crops are surer and less sensitive to the evils of adverse seasons. So far we have no evidence that any of the soils analyses of which are reported in this bulletin require the addition of lime to make them satisfactorily productive. In some pot experiments we have tried lime on most of our typical soils without any beneficial effect except on spongy reedbrake which contained abnormal amounts of organic matter and was very acid. The data given in the tables show further, that some of our most productive soils do not con-

tain more than one-tenth of one per cent of lime, while many of them do not contain more than two-tenths of one per cent. We believe that the evidence is conclusive that from one-tenth to two-tenths per cent. of lime is ample for the soils and crops of this State.

Interpretation of soil analyses.—Interpretations of analytical results should be reliable and accurate.

The plant food in a soil may determine the yield of crops, but it is not the on'y thing that may determine the yield.

Other things being equal, soils containing the largest total amounts of plant food will have the most plant food available for crops.

Other things being equal, surface soils, with many years' exposure as such, will yield larger crops than former subsoils recently exposed as surface soils.

Other things being equal, the deepest surface soils give the best yields.

Seven-hundredths to one-tenth per cent of phosphoric acid is sufficient for a productive soil.

The work reported in this bulletin fails to show the minimum amount of lime or potash that is necessary for productive soi's.

Except on spongy reedbrake soils, consisting largely of organic matter, the application of lime has not helped any crop on any soil in this Sta

There is no evidence that the application of potash, as a food for plants, has helped or increased the yield of any crop on any soil in this State.

Soils containing .05 per cent. of phosphoric acid or less require the use of superphosphates if large yields are to be obtained.

Leguminous crops, which add nitrogen to the soil and improve the water conditions, increase more than any other one thing, perhaps, the productiveness of cotton soils.

We have not found a cultivated soil, which analysis showed to be rich in plant food, that was not productive if other essential conditions were good.

It is desirable to have soil material as fine as is consistent with good texture.

It is desirable to have soils maintain a uniform water supply. Wide variations in the amount of soil water are hurtful.

As botanists collect herbariums to be used in identifying un-

known plants, so chemists may obtain such a store of information concerning the soils in a State as will be of very great service in dealing with samples sent by farmers and others for examination and advice as to treatment.

Soils of the Northeastern Prairie Region.

Lab. No.	County.	Location of Land; Address of Owner.	Township, Range and Section.	Character of Soil.	Showing Depth in In. Sample was Taken.	Approx. Yield per Acre Unfertilized. Corn, in Bushels.	Cotton, lbs., lint.	Chemical Analysis. Moisture.	Volatile and Organic Matter.	Insoluble Matter.	Soluble Silica.	Iron and Alumina Oxide.	Calcium Oxide (Lime).	Phosphoric Acid.	Potash	Nitrogen.	Physical Analysis. Gravel.	Sand.	Fine Sand.	Very Fine Sand.	Silt.	Fine Silt.	Clay.
926	Kemper.	2 mi ne Scooba	T 12, R 18 e, Sec 27	Ash-gray prairie	5	....	166	.77	2.46	90.05	.060	5.82	.192	.110	.076	.050	.....	15.87	31.69	24.72	17.03	2.38	4.46
927		2 mi ne Scooba	T 12, R 18 e, Sec 27	Subsoil of 926	7	....	....	1.85	3.47	83.85	.075	11.12	.280	.079	.105	.040	.....	10.82	22.96	13.53	27.40	4.23	16.05
928		4 mi ne Scooba	T 12, R 18 e, Sec 23	Prairie valley, black	11	....	333	4.15	7.52	67.86	.106	15.86	1.68	.156	.465	.130	.....	6.12	13.13	7.71	35.40	8.04	16.43
929		Binnsville, se	T 12, R 18 e, Sec 12	Postoak prairie	6	....	125	2.95	5.90	73.71	.095	14.64	.980	.072	.185	.070	.66	11.11	8.08	14 40	43.66	3.93	8.72
930		Binnsville, se	T 12, R 18 e, Sec 12	Subsoil of 929	10	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7.06	4.23	9.63	31.98	4.42	32.15
931		Binnsville, n	T 13, R 19 e, Sec 29	Ash-gray prairie	6	....	250	2.67	5.30	78.22	.077	11.37	.535	.053	.263	.060	.....	3.40	4.55	3.60	58.65	4.08	17.25
932		Noxubee Ferry	T 13, R 19 e, Sec 30	Noxubee bottom	6	....	366	3.50	8.57	71.54	.093	13.92	.960	.188	.442	.155	.....	2.50	10.80	12.42	3.33	6.06	19.02
933		F A Denton, Cooksville	T 13, R 19 e, Sec 9	Red upland	3	....	250	.36	2.51	93.70	.065	3.79	.210	.084	.148	.050	.....	34.80	17 70	14.04	24.21	1.14	4.92
934		F A Denton, Cooksville	T 13, R 19 e, Sec 9	Subsoil of 933	6	....	....	.63	2.87	88.72	.060	7.08	.200	.077	.171	.040	.....	24.45	11.46	15.26	29.89	1.95	13.43
935		2 mi ne Cooksville	T 14 R 19 e, Sec 33	Postoak prairie	3	....	200	3.22	7.47	72.30	.115	15.61	.325	.090	.201	.070	.....	8.54	4.13	17.32	29.10	6.97	23.58
936		2 mi ne Cooksville	T 14, R 19 e, Sec 33	Subsoil of 935	6	....	....	7.45	7.55	60.20	.069	22.98	.390	.053	.271	.045	.....	2.46	1.98	4.11	26.35	5.10	46.12
937		2½ mi ne Cooksville	T 14, R 19 e, Sec 28	Black prairie	5	....	366	5.56	7.42	68.55	.065	16.68	.985	.085	.218	.095	.....	4.95	6.40	15.98	35.34	7.08	19.16
938		2½ mi ne Cooksville	T 14, R 19 e, Sec 28	Subsoil of 937	8	....	....	5.55	7.05	66.90	.057	18.66	.835	.048	.257	.053	.....	5.16	7.46	13.03	21.54	8.57	31.83
939	Noxubee.	Fox Trap Prairie, J Binion	T 14, R 19 e, Sec	Black prairie	6	....	250	7.77	12.05	55.08	.056	21.94	.156	.189	.478	.153	.....	17.05	7.09	4 45	18.28	10.20	22.96
940		10 mi e Macon	T 15, R 19 e, Sec	Black prairie	5	....	250	7.10	9.92	60.84	.143	19.56	.145	.121	.463	.....	.....	4.60	10.24	5.03	29.17	8.33	25 48
941		10 mi e Macon	T 15, R 19 e, Sec	Black prairie	6	....	333	4 93	8.16	69.12	.174	16.23	1.130	.121	.426	.....	.....	4.61	5.60	15 04	37.51	8.41	16.23
942		Cliftonville	T 16, R 18 e, Sec 16	Ash prairie	6	....	250	6 82	7.41	62.64	.103	20.63	1.18	.263	.400	.....	.....	7.88	8.94	12.18	23.63	9.49	23.67
943		S D Lee, Cliftonville	T 16, R 18 e, Sec 16	Ash prairie, after melilotus	5	....	333	5.08	8.36	43.91	.085	15.81	15.57	.302	.500	.....	8.00	7.32	6.46	11.04	25 76	9.50	18.70
944		S D Lee, Cliftonville	T 16, R 18 e, Sec 16	Prairie bottom, black	5	....	333	6.83	9.64	56.49	.179	18.01	5.24	.321	.509	.....	.....	1.33	8.45	11.29	21.63	7.28	31.31
945		S D Lee, Cliftonville	T 16, R 18 e, Sec 16	Lime-pebble prairie	6	....	250	6.31	10.17	55.41	.123	19.48	5.15	.296	.574	.....	7.41	7.42	8.60	11.05	23.26	6.46	20.88
946		S D Lee, Cliftonville	T 16, R 18 e, Sec 16	Postoak prairie	4	....	250	5 27	7.73	65 07	.071	21.13	.945	.105	.450	.....	.....	4.21	6.83	12.35	29.90	7.70	26.72
948		2 mi w Deerbrook	T 16, R 17 e, Sec 13	Black prairie	6	....	166	5.25	8.81	62.89	.096	17.48	.990	.046	.360	.....	.....	5.04	6.48	11.06	27.83	7.63	29.25
949		3 mi e Brooksville	T 16, R 17 e, Sec 14	Postoak prairie	4	....	125	4.95	7.17	67 17	.086	21.28	.485	.105	.372	.....	.....	7.26	2.80	10.70	28.34	6.95	32.45
950		3 mi e Brooksville	T 16, R 17 e, Sec 14	Subsoil of 949	8	....	....	4.91	6.25	68.39	.117	18.86	.535	.051	.346	.....	.....	2.98	1.60	7.45	30.81	7.82	33.32
951		3 mi n Brooksville	T 16, R 17 e, Sec 5	Postoak prairie	3	....	100	1.17	4.18	82.39	.050	10.86	.325	.079	.245	.....	.....	13.99	18.31	18.01	33.24	2.76	7.80
952		3 mi n Brooksville	T 16, R 17 e, Sec 5	Subsoil of 951	6	....	....	2.55	4.31	78.43	.063	13.33	.290	.067	.243	.....	.....	7.36	9.81	10.76	38.77	6.01	19.75
1153	Lowndes.	Steve Thrower, Mayhew	T 19, R 16 e, Sec 5	Prairie bottom, yellow	8	....	....	5.37	8.75	66.10	.134	13.23	3.56	.111	.358	.122	.....	1.55	7.46	18.65	35 45	4.79	16.08
1154		Steve Thrower, Mayhew	T 19, R 16 e, Sec 5	Black prairie, Johnson grass	10	....	....	4.90	9.60	62.62	.132	13.99	3.71	.140	.387	.110	.....	9.67	13.10	14.07	22.44	5.37	19 14
1155		Steve Thrower, Mayhew	T 19, R 16 e, Sec 5	Postoak prairie	4	....	250	4.83	7.72	69.64	.137	15.39	.315	.093	.283	.070	.....	6.39	10.31	15.18	21.56	5.30	27.28
1156		Steve Thrower, Mayhew	T 19, R 16 e, Sec 5	Subsoil of 1155	8	....	....	6.73	8.22	62.80	.169	19.61	.370	.050	.375	.030	.....	3.50	6.42	9.86	16.42	4 25	44.32
1157		Steve Thrower, Mayhew	T 19, R 16 e, Sec 5	Postoak prairie, improved	6	....	500	3.16	8.58	72.91	.275	12.71	.360	.123	268	.140	.....	9.12	12.19	14.77	25.42	4.55	21.92
526	Oktibbeha	Hort Depart College	T 18, R 14 e, Sec 1	Subsoil, black, original surf.	36	....	....	.....	7.33	81.3	.20	8.9	.55	33	.45	.....	.....	.....	.....	.....	.....	.....	.....
581		W L Hutchinson, College	T 18 R 14 e, Sec 12	Sandy upland	6	....	125	.70	2.29	89.94	.16	5.98	.11	.096	.39	.....	9.92	35.17	24.49	12.05	10.66	.56	4.34
582		W L Hutchinson, College	T 18, R 14 e, Sec 12	Black subsoil	15	....	....	3.05	7.48	75.48	.01	11.81	.85	.29	.49	.....	1.00	13.64	11.22	15.12	31.36	3.21	14.17
583		W L Hutchinson, College	T 18 R 14 e, Sec 12	Subsoil red upland	9	....	....	3.60	5.66	73.74	.063	15.11	.315	.247	.38	.....	.....	.....	.....	.....	.....	.....	.....
584		W L Hutchinson, College	T 18, R 14 e, Sec 12	Black upland	4	30	300	3.14	6.81	71.61	.10	14.58	1.06	.57	.92	....	1.62	26.02	17 81	12.43	17.88	2.26	13.08
585		W L Hutchinson, College	T 18, R 14 e, Sec 12	Branch bottom	7	60	....	2.75	5.18	79 55	.09	10.66	.63	.30	.46	....	3.25	14.75	12.53	21.23	27.05	1.64	13.71
586		W L Hutchinson, College	T 18, R 14 e, Sec 12	Yellow upland, pasture	12	10	....	2.16	3.22	85.00	.04	8.78	.235	.115	.210	....	3.52	17.80	18.92	12.21	5.50	1.84	13.37

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Soils of the Northeastern Prairie Region.

Lab. No.	County.	Location of Land; Address of Owner.	Township, Range and Section.	Character of Soil.	Showing Depth in In. Sample was Taken.	Approx. Yield per Acre Unfertilized		Chemical Analysis.									Physical Analysis.							
						Corn in Bushels	Cotton, lbs., lint.	Moisture.	Volatile and Organic Matter.	Insoluble Matter.	Soluble Silica.	Iron and Alumnia Oxide.	Calcium Oxide (Lime).	Phosphoric Acid.	Potash.	Nitrogen.	Gravel.	Sand.	Fine Sand.	Very Fine Sand.	Silt.	Fine Silt.	Clay.
1181	Chickasaw	3 mi n Okolona	T 12 s, R 5 e, Sec 11	Taliponela bottom, gray	12	40	....	6.50	9.69	60.57	.064	13.66	5.80	.140	.402	.192	....	9.78	6.41	12.12	29.29	3.62	20.20
1182		4 mi s Shannon	T 12 s, R 5 e, Sec 1	Yellow upland	4	....	100	1.85	2.42	90.06	.057	5.05	.160	.047	.135	.040	....	17.58	27.18	26.69	15.15	1.78	7.40
1183		4 mi s Shannon	T 12 s, R 5 e, Sec 1	Subsoil of 1182	10	....	....	4.77	3.53	80.19	.041	10.50	.110	.066	.249	.036	....	10.03	18.12	16.60	20.71	2.91	23.83
1274		J W Hamilton, Houlka	T 12 s, R 3 e, Sec 21	Red upland Pontotoc ridge	6	15	....	1.17	3.39	87.41	.020	7.40	.110	.056	.189	.062	....	17.36	6.07	22.07	28.31	4.76	12.25
1275		J W Hamilton, Houlka	T 12 s, R 3 e, Sec 21	Subsoil of 1274	12	....	....	2.46	4.00	81.72	.053	10.97	.150	.041	.283	.048	....	9.94	3.69	19.15	36.27	5.24	19.60
1276		8 mi n Houston	T 13 s, R 3 e, Sec 4	Ridge land, poor	5	....	125	1.26	3.50	88.07	.056	6.46	.150	.064	.262	.070	....	5.18	3.49	17.81	56.35	4.27	8.75
1277		8 mi n Houston	T 13 s, R 3 e, Sec 4	Subsoil of 1276	....	....	....	1.78	3.49	84.97	.055	8.80	.110	.064	.306	.070	....	5.76	2.63	13.99	51.20	4.96	15.79
1184		3 mi s Shannon	T 11 s, R 5 e, Sec 36	Taliponela bottom	8	40	....	5.38	7.32	70.56	.091	13.11	1.20	.160	.385	.146	....	13.97	19.00	16.11	19.47	5.63	12.11
1185		¼ mi s Shannon	T 11 s, R 6 e, Sec 19	Stiff creek bottom	8	....	375	4.95	6.83	73.68	.080	12.14	.815	.134	.340	.162	....	28.15	13.25	6.99	17.65	6.74	16.79
1186		3 mi w Shannon, Rogers	T 11 s, R 5 e, Sec 21	Black prairie, rusts cotton	8	25	....	6.18	8.50	67.86	.145	13.56	1.61	.210	.321	.240	....	11.68	14.45	15.34	24.81	4.18	13.42
1187		3 mi w Shannon, Rogers	T 11 s, R 5 e, Sec 21	Yellow upland	4	....	250	1.27	3.34	85.44	.105	3.71	3.27	.210	.216	.100	1.72	10.74	20.14	20.70	34.99	1.41	3.44
1188		3 mi w Shannon, Rogers	T 11 s, R 5 e, Sec 21	Subsoil of 1187	10	....	....	1.34	2.23	89.65	.089	5.27	.585	.064	.172	.050	....	11.56	21.60	19.64	31.13	2.16	9.59
1189		3 mi w Shannon, Rogers	T 11 s, R 5 e, Sec 21	Black prairie	....	....	250	5.47	7.87	71.64	.160	12.27	1.27	.237	.297	.195	....	10.17	13.76	19.25	27.55	3.67	11.34
1190		2 mi w Shannon, Rogers	T 11 s, R 5 e, Sec 22	Chiwappa creek bot'm, stiff	12	50	....	5.55	7.11	70.72	.143	13.16	1.47	.194	.395	.158	....	10.93	17.02	9.38	27.02	6.51	15.44
1191		1 mi w Shannon	T 11 s, R 5 e, Sec 23	Chiwappa creek bot'm, light	5	....	250	1.73	3.77	88.03	.098	5.30	.235	.068	.157	....	....	9.95	40.21	11.98	20.69	2.93	8.02
1192		1 mi w Shannon	T 11 s, R 5 e, Sec 23	Subsoil of 1191	10	....	....	2.16	2.61	88.74	.044	5.79	.190	.048	.132	.056	....	9.74	37.83	19.47	14.28	2.58	11.20
1193		1 mi n Shannon	T 11 s, R 6 e, Sec 18	Creek bottom	10	....	500	5.73	7.72	68.05	.074	15.04	.940	.185	.402	.136	....	8.70	26.97	10.79	13.24	7.97	17.93
1194		2½ mi n Shannon	T 11 s, R 6 e, Sec 6	Creek bottom, light	8	....	500	3.35	6.30	78.94	.064	9.78	.470	.118	.269	.154	....	4.08	17.79	25.30	26.74	5.79	10.02
1195		2½ mi n Shannon	T 11 s, R 6 e, Sec 6	Subsoil of 1194	10	....	....	3.56	5.67	79.72	.060	9.84	.450	.102	.279	.114	....	5.02	23.91	18.04	23.99	5.79	14.18
1200	Lee	2 mi n Tupelo	T 9 s, R 6 e, Sec 20	Town Creek bottom, black	6	....	500	1.26	4.36	85.26	.070	5.62	.500	.083	.200	.084	....	3.78	43.30	19.10	16.60	3.90	8.22
1201		2 mi n Tupelo	T 9 s, R 6 e, Sec 20	Subsoil of 1200	12	....	....	5.74	12.44	60.53	.050	20.49	.970	.100	.520	.155	....	5.64	9.85	6.03	21.38	3.52	23.62
1202		3 mi s Saltillo	T 9 s, R 6 e, Sec 4	Mud Creek bottom, black	8	60	....	2.13	4.54	85.62	.060	7.10	.340	.076	.250	.089	....	3.52	34.32	20.65	21.18	4.74	10.16
1203		3 mi s Saltillo	T 9 s, R 6 e, Sec 4	Subsoil of 1202	12	....	....	6.19	12.11	58.23	.100	20.78	.750	.230	.490	.170	....	2.93	7.52	6.45	21.06	15.09	29.05
1204		4 mi s Guntown	T 8 s, R 6 e, Sec 10	Yellow upland, forest	3	....	....	.58	2.31	93.23	.099	3.49	.053	.032	.096	.043	....	25.56	21.40	10.37	32.39	2.70	5.33
1205		4 mi s Guntown	T 8 s, R 6 e, Sec 10	Subsoil of 1204	12	....	....	1.76	3.47	86.01	.060	7.97	.050	.044	.214	.042	....	9.61	19.64	8.39	26.42	16.11	14.60
1206		½ mi n Guntown	T 7 s, R 6 e, Sec 15	Stiff beeswax prairie	6	....	....	2.85	6.76	63.32	.096	9.03	9.63	.253	.179	.126	2.65	13.58	30.87	19.85	7.13	3.48	8.00
1207		1 mi e Baldwyn	T 7 s, R 7 e, Sec 6	Clay subsoil	24	....	....	5.60	8.19	71.09	.095	14.42	.34	.051	.252	.182	....	.35	6.61	8.26	26.76	8.24	35.93
1209		1 mi e Baldwyn	T 7 s, R 7 e, Sec 6	Creek bottom, sandy	6	50	....	.93	3.57	90.60	.161	4.05	.160	.055	.129	.110	....	....	....	....	....	....	....
1210		1 mi e Baldwyn	T 7 s, R 7 e, Sec 6	Subsoil of 1209	12	....	....	.80	2.45	91.23	.083	4.67	.085	.072	.129	.074	....	....	....	....	....	....	....
1213		1½ mi e Baldwyn, Richardson	T 7 s, R 7, e, Sec 6	Sandy upland, repres'nt'tive	4	....	....	.74	2.18	93.13	.060	3.42	.030	.025	.086	.052	....	8.76	25.18	19.69	34.36	2.18	6.75
1214		1½ mi e Baldwyn, "	T 7 s, R 7 e, Sec 6	Subsoil of 1213	12	....	....	.64	2.47	91.47	.085	4.77	.070	.025	.143	.047	....	....	....	....	....	....	....
1211		1 mi e Baldwyn, "	T 6 s, R 7 e, Sec 31	Creek bottom, east, loam	6	....	375	2.77	4.65	82.49	.087	8.07	.510	.090	.220	.116	....	1.90	40.74	18.90	17.88	3.93	8.50
1212		1 mi e Baldwyn, "	T 6 s, R 7 e, Sec 31	Subsoil of 1211	12	....	....	2.91	4.00	83.93	.081	7.69	.300	.089	.181	.094	....	.82	30.79	23.54	20.75	3.06	13.25
1217		5 mi n Baldwyn, Price	T 6 s, R 6 e, Sec 13	Postoak ridge, beeswax	3	....	....	1.37	3.77	87.54	.059	6.36	.190	.036	.098	.100	....	3.22	8.73	51.08	17.78	2.46	11.59
1218		5 mi n Baldwyn, Price	T 6 s, R 6 e, Sec 13	Subsoil of 1217	12	....	....	5.37	10.44	60.98	.100	21.12	.625	.038	.239	.100	....	2.83	15.49	13.96	8.53	2.46	39.00
1219		4 mi s Booneville	T 5 s, R 7 e, Sec 33	Sandy upland, represent'tive	7	....	....	.63	2.10	93.06	.049	3.60	.120	.043	.103	.064	....	22.06	29.50	23.52	14.66	1.85	5.12
1220		4 mi s Booneville	T 5 s, R 7 e, Sec 33	Subsoil of 1219	12	....	....	.62	1.99	92.83	.057	4.10	.070	.039	.121	.050	....	22.08	27.89	22.84	15.30	1.92	7.18
1221	Prentiss.	Dr Price, Booneville	T 5, R 7 e, Sec 16	"Buckshot" soil, gravel	7	....	....	.91	2.50	92.83	.054	3.36	.120	.065	.102	.054	2.69	11.56	14.67	25.90	34.75	3.96	5.23

1222		Dr Price, Booneville	T 5, R 7 e, Sec 16	Subsoil of 1221	12			1.20	2.21	90.98	.070	5.02	.100	.029	.083	.018		10.32	13.54	25.40	34.95	4.53	10.31
1223		Dr Price, Booneville	T 5, R 7 e, Sec 16	Ash prairie, pasture	6			4.68	11.14	56.45	.083	11.30	11.93	.329	.321	.126		2.74	11.30	29.92	19.81	1.85	13.27
1224		Dr Price, Booneville	T 5, R 7 e, Sec 16	Subsoil of 1223	12			4.92	12.62	41.69	.068	12.40	19.78	.151	.418	.078		1.70	7.79	15.98	17.05	2.42	25.81
1225		Dr Price, Booneville	T 5, R 7 e, Sec 16	Beeswax prairie	6			7.33	5.40	66.51	.065	16.26	.810	.129	.226	.096		2.96	7.54	21.56	15.50	5.89	32.96
1226		Dr Price, Booneville	T 5, R 7 e, Sec 16	Subsoil of 1225, jointed clay	12													2.54	6.64	10.47	11.32	9.97	39.82
1227		Dr Price, Booneville	T 5, R 7 e, Sec 16	Upland loam	8			3.24	3.97	81.39	.070	8.39	.340	.174	.273	.088		10.62	38.06	18.02	9.00	3.23	13.78
1228		Dr Price, Booneville	T 5, R 7 e, Sec 16	Subsoil of 1227	15			3.00	6.87	74.83	.041	13.81	.310	.249	.453	.044		11.72	33.64	8.44	3.78	2.91	30.09
1229		1 mi e Booneville	T 5 s, R 7 e, Sec 11	Blackjack ridge, sandy, fo'st	4			.92	3.03	91.98	.095	3.59	.070	.009	.105	.080	2.36	5.63	17.37	24.84	37.61	2.01	6.08
1230		1 mi e Booneville	T 5 s, R 7 e, Sec 11	Subsoil of 1229	12			1.07	2.40	91.42	.080	4.85	.060	.006	.098	.048	2.40	5.00	12.19	25.25	38.94	2.61	9.66
1234		7 mi n Booneville	T 4 s, R 7 e, Sec 2	Blackjack ridge, sandy	8			.72	2.06	93.63	.093	3.39	.052	.018	.088	.026		7.96	18.63	18.51	44.03	3.45	5.67
1235		7 mi n Booneville	T 4 s, R 7 e, Sec 2	Subsoil of 1234	15			1.82	2.95	86.76	.100	7.85	.060	.035	.152	.028		7.05	14.95	23.20	32.68	3.48	13.53
1250		7 mi n Blackland	T 4 s, R 6 e, Sec 4	Sandy white soil	5	12		.62	2.61	93.00	.064	3.16	.205	.027	.089	.058	.80	8.10	29.00	31.52	21.62	2.09	3.69
1251		7 mi n Blackland	T 4 s, R 6 e, Sec 4	Subsoil of 1250	11			.50	1.76	93.65	.048	3.65	.140	.037	.130	.044		6.36	27.23	32.79	22.64	2.23	6.41
1253		6 mi w Booneville, Jones	T 5 s, R 6 e, Sec 9	Black bottom, typical	8		500	3.00	5.50	78.04	.137	9.79	1.32	.092	.359	.090							
1254		6 mi w Booneville	T 5 s, R 6 e, Sec 9	White upland, sandy loam	6		166	1.03	2.05	93.03	.122	3.59	.160	.071	.122	.050							
1255		6 mi w Booneville	T 5 s, R 6 e, Sec 9	Subsoil of 1254	12			.64	2.40	90.33	.084	5.81	.155	.076	.162	.016							
1256		1 mi s Blackland	T 5 s, R 6 e, Sec 16	Creek bottom, black	9		500	3.22	6.35	79.26	.102	8.47	1.07	.114		.126							
1257		¼ mi n Geeville	T 6 s, R 6 e, Sec 9	Twenty-Mile Creek bottom	12		375	4.47	8.31	70.84	.127	13.31	.830	.140	.565	.140		2.90	19.41	18.99	26.03	4.79	14.90
1258		1 mi sw Geeville	T 6 s, R 6 e, Sec 17	"Rawhide" land, subsoil	12			4.76	4.48	73.82	.090	13.82	.100	.042	.229	.052		2.77	5.24	16.73	22.28	6.16	26.51
1241		4 mi se Corinth	T 2 s, R 7 e, Sec 17	Tuscumbia River bottom	10			1.20	4.85	86.88	.076	5.84	2.25	.071	.147	.146		3.02	9.58	34.09	34.60	2.86	7.96
1242		4 mi se Corinth	T 2 s, R 7 e, Sec 17	Subsoil of 1241	18			1.89	5.38	84.79	.110	7.35	.190	.067	.131	.120							
1245		1 mi e Kossuth	T 2 s, R 6 e, Sec 24	Creek bottom, white	10			1.10	3.20	89.17	.050	5.57	.245	.051	.185	.049		5.99	22.56	21.10	33.28	4.30	8.29
1247		¼ mi w Kossuth	T 2 s, R 6 e, Sec 27	Subsoil, surface light gray	12		100	.63	2.20	92.80	.048	4.36	.178	.040	.129	.070		11.94	24.68	35.45	17.56	2.11	5.19
1248		6 mi s Kossuth	T 3 s, R 6 e, Sec 9	Surface light gray	6		250	.81	2.82	91.20	.067	4.46	.140	.050	.157	.060		.90	19.98	35.63	31.38	2.30	5.90
1249		6 mi s Kossuth	T 3 s, R 6 e, Sec 9	Subsoil of 1248	12			1.15	2.61	88.34	.070	6.98	.120	.045	.208	.064		.77	13.16	28.25	37.45	3.91	12.56
1259		4 mi w Graham	T 6 s, R 4 e, Sec 11	Gray upland, red subsoil	2			1.22	4.83	89.40	.035	3.74	.125	.036	.107	.098		15.81	19.20	13.95	36.73	3.86	4.16
1261		9 mi ne New Albany	T 6 s, R 4 e, Sec 29	Creek bottom, sandy	6		500	1.32	4.77	86.58	.068	7.35	.190	.048	.276	.058		2.99	53.95	16.68	12.76	2.18	5.82
1262		9 mi ne New Albany	T 6 s, R 4 e, Sec 29	Subsoil, from roadside	12			6.50	7.89	58.02	.086	25.69	.130	.064	.238	.058		.48	8.63	9.78	11.21	6.80	47.43
1263		2 mi ne New Albany	T 7 s, R 3 e, Sec 2	Sandy soil	4		166	.82	2.74	90.76	.076	4.99	.160	.035	.187	.080		8.34	15.24	34.58	28.65	2.74	6.13
1264		2 mi ne New Albany	T 7 s, R 3 e, Sec 2	Subsoil of 1263	10			1.41	2.77	87.52	.054	7.28	.160	.033	.265	.058		5.10	4.54	35.11	34.14	3.24	13.03
1265		2 mi ne New Albany	T 7 s, R 3 e, Sec 2	Surface, level	8		250	.78	2.72	91.20	.087	4.53	.190	.038	.170	.092		2.82	7.02	44.82	34.48	1.91	4.73
1266		4 mi se New Albany	T 7 s, R 3 e, Sec 29	Pontotoc ridge, represe'ative	6			1.13	2.90	88.11	.064	6.89	.140	.052	.205	.066		13.31	10.75	30.32	28.60	2.90	9.73
1267		4 mi se New Albany	T 7 s, R 3 e, Sec 29	Subsoil of 1266	14			2.34	3.15	83.10	.056	10.17	.150	.057	.359	.040							
1268		8 mi se New Albany	T 8 s, R 3 e, Sec 8	Second bottom of creek	12	30		1.84	3.24	85.56	.066	8.38	.205	.093	.258	.092		3.23	9.39	32.12	34.84	3.50	11.68
1030		Near New Albany		Pontotoc ridge soil, typical				1.02	3.57	90.37	.025	3.95	.110	.024	.190								
1031		Near New Albany		Subsoil of 1030				.83	2.59	85.65	.280	10.00	.230	.064	.489								
1269		9 mi n Pontotoc	T 8 s, R 3 e, Sec 21	Pontotoc Ridge soil, typical	6	30		1.43	3.57	85.56	.058	6.33	.142	.167	.336	.096							
1270		9 mi n Pontotoc	T 8 s, R 3 e, Sec 21	Subsoil of 1269	12			1.83	3.18	84.95	.147	8.63	.310	.103	.581	.052							
1272		6 mi n Pontotoc	T 9 s, R 3 e, Sec 4	Red soil of Pontotoc Ridge	24			2.97	5.28	74.39	.056	16.41	.106	.094	.333	.046		19.65	4.05	11.05	30.66	4.85	25.35
1273		6 mi s Pontotoc	T 11 s, R 3 e, Sec 4	Yellow subsoil	24			2.18	3.84	82.97	.067	10.51	.100	.035	.208	.036		26.94	11.03	11.33	21.30	4.31	19.46
1236		10 mi s Corinth, Alcorn Co	T 3 s, R 7 e, Sec 14	Yellow loam, flat	8		250	1.60	4.41	87.05	.093	6.02	.145	.072	.178	.106		4.70	11.07	18.53	48.89	4.93	4.17
1237		10 mi s Corinth, Alcorn Co	T 3 s, R 7 e, Sec 14	Subsoil of 1236	14			2.00	4.00	83.95	.102	9.18	.100	.055	.227	.063							

Prentiss — Alcorn — Union — Pontotoc

Soils of the Brown and Yellow Loam Region.

Lab. No.	County.	Location of Land; Address of Owner.	Township, Range and Section.	Character of Soil.	Showing Depth in In. Sample was Taken.	Approx. Yield per Acre Unfertilized. Corn, in Bushels.	Cotton, lbs. Lint.	Chemical Analysis. Moisture.	Volatile and Organic Matter.	Insoluble Matter.	Soluble Silica.	Iron and Alumina Oxide.	Calcium Oxide (Lime).	Phosphoric Acid.	Potash.	Nitrogen.	Physical Analysis. Gravel.	Sand.	Fine Sand.	Very Fine Sand.	Silt.	Fine Silt.	Clay.
625	Madison.	A B McKay, Ridgeland	Trucking Section; Lands used generally for Strawberries, Tomatoes, Cabbage, Etc.	Surface, brown loam	6	....	166	.89	3.30	89.73	.13	5.08	.29	.062	.215	....	4.10	1.19	.94	15.45	64.56	1.92	7.96
626		A B McKay, Ridgeland		Subsoil of 625	15	....	....	....	....	....	....	....	....	....	....	....	1.37	2.48	1.19	15.94	51.75	6.76	13.85
627		A B McKay, Ridgeland		Subsoil of 625	36	....	....	....	....	....	....	....	....	....	....	....	1.75	6.16	1.99	10.99	63.41	3.74	6.88
628		A B McKay, Ridgeland		Subsoil of 625	60	....	....	....	....	....	....	....	....	....	....	....	....	1.34	.46	8.10	63.31	2.45	16.35
629		Dr H E McKay, Madison		Surface, brown loam	6	....	166	.65	2.47	91.09	.176	4.59	.22	.076	.20	....	....	....	....	....	....	....	....
633		Dr H E McKay, Madison		Surface, brown loam	6	....	166	1.50	1.67	90.72	.101	5.23	.17	.083	.170	....	....	....	....	....	....	....	....
879		Dr H E McKay, Madison		Bottom, surface soil	6	....	....	.53	2.45	91.51	.062	4.28	.123	.061	.250	.107	....	1.93	1.27	39.26	48.04	1.70	3.31
880		Dr H E McKay, Madison		Subsoil of 879	15	....	....	.75	2.75	90.73	.080	4.88	.120	.038	.220	.045	....	1.90	1.98	27.45	56.05	2.37	4.57
881		Dr H E McKay, Madison		Light brown loam, surface	6	....	....	.78	2.50	90.31	0.51	5.46	.165	.040	.257	.045	....	.67	1.36	34.62	51.15	2.53	5.37
882		Dr H E McKay, Madison		Subsoil of 881	12	....	....	1.88	3.24	81.92	.142	10.81	.120	.079	.433	.035	....	.23	.15	23.30	48.64	5.60	14.74
883		Dr H E McKay, Madison		Worn red hill, subsoil	12	....	....	1.83	3.92	81.84	.065	10.79	.145	.068	.396	.040	....	.87	1.16	20.33	53.24	3.78	14.46
877		J T Dameron, Madison	T 7 R 2 e, Sec 17	Alkali or salt spot	4	....	....	.57	2.45	91.46	.055	4.24	.150	.061	.200	.043	3.75	5.10	5.27	31.68	45.15	1.52	4.95
878		J T Dameron, Madison	T 7, R 2 e, Sec 17	Subsoil of 877	12	....	....	1.26	2.42	89.33	.090	5.90	.170	.020	.280	.035	4.60	2.91	3.17	16.18	53.25	3.48	12.66
884		R C Lee, Madison		Brown surface	8	....	....	.68	3.01	91.25	.065	4.03	.145	.042	.180	.060	....	1.96	1.52	28.39	58.82	1.80	3.24
885		R C Lee, Madison		Subsoil of 884	12	....	....	1.05	2.84	87.24	.088	7.72	.130	.052	.263	.035	....	1.44	1.77	20.33	58.76	2.57	11.75
876		2 mi w Ridgeland	T 7 R 1 e, Sec 22	Clay subsoil	60	....	....	2.54	5.57	76.12	.150	13.95	.300	0.22	.326	.005	....	3.49	27.85	11.98	13.37	7.99	27.06
886		1 mi e Canton	T 9, R 3 e, Sec 19	Gray silt soil	5	....	100	1.05	2.54	90.10	.079	5.40	.265	.039	.225	....	....	.94	1.59	35.02	51.97	1.97	4.85
887		1 mi e Canton	T 9, R 3 e, Sec 19	Subsoil of 886	8	....	....	2.35	3.47	80.29	.067	10.12	.205	.073	.347	....	....	.21	.54	27.57	49.67	2.80	13.25
888		9 mi e Canton	T 9, R 4 e, Sec 17		10	....	....	.93	2.52	88.92	.087	4.64	.225	.045	.150	....	....	1.16	.89	37.89	50.37	1.79	4.22
890	Leake	18 mi e Canton	T 10, R 5 e, Sec 23	Yellow surface	4	....	....	1.65	3.54	85.23	.093	8.53	.110	.018	.281	....	....	2.05	5.64	24.18	50.13	3.36	9.47
891		18 mi e Canton	T 10, R 5 e, Sec 23	Subsoil of 890	8	....	....	2.51	3.65	80.53	.100	11.75	.155	.028	.488	....	....	1.88	2.39	11.27	58.70	5.06	14.86
892		10 mi w Carthage	T 10, R 6 e,	Surface	8	....	....	.82	2.55	91.07	.145	4.88	.110	.019	.160	....	....	12.23	11.98	16.24	47.14	2 48	6.89
893		10 mi w Carthage	T 10, R 6 e,	Subsoil of 892	60	....	....	1.48	3.52	83.12	.097	11.48	.050	.014	.175	....	....	28.14	22.35	5.76	19.12	2.19	17.38
894		Bluff e side Yockanookany	T 10, R 6 e, Sec 15	Red sand	36	....	....	.98	2.61	87.68	.100	8.24	.025	.022	.165	....	....	....	....	....	....	....	....
895		4½ mi w Carthage	T 10, R 7 e, Sec 9	Yellow loam	6	....	....	.31	6.74	94.44	.080	2.75	.05	.016	.093	....	....	13.45	20.52	15.23	40.78	2.42	5.00
896		4½ mi w of Carthage	T 10, R 7 e, Sec 9	Subsoil of 895	12	For	est	1.12	3.05	84.22	.113	10.23	.06	.029	.310	.01	....	7.58	13.77	15.62	34.35	2.46	2.79
897	Attala	1 mi n of Kosciusko	T 14, R 7 e, Sec 16	Surface, gray loam	12	....	250	.44	3.57	91.30	.039	4.11	.115	.030	.190	.06	....	1.90	2.91	27.02	55.91	3.09	4.69
898		4 mi n of Kosciusko	T 15, R 7 e, Sec 35	Surface, gray loam	6	....	125	.61	3.68	89.33	.134	5.61	.210	.044	.229	.06	....	5.44	5.50	25.24	50.45	3.15	5.45
899		4 mi n of Kosciusko	T 15, R 7 e, Sec 35	Subsoil of 898	12	....	....	1.23	5.73	78.73	.083	13.01	.375	.038	.396	.035	....	1.65	2.71	15.87	53.91	6.07	12.67
900		8 mi n of Kosciusko	T 15, R 8 e, Sec 19	Branch bottom	4	....	....	.51	3.33	91.59	.051	4.01	.130	.047	.160	.06	2.68	18.71	20.33	9.65	37.42	2.75	4.42
901		8 mi n of Kosciusko	T 15, R 8 e, Sec 19	Subsoil of 900	8	....	....	.71	2.14	91.94	.078	4.61	.077	.027	.155	....	6.43	8.37	12.50	10.47	50.85	2.30	6.03
902		Near Choctaw Co. line	T 16, R 8 e, Sec 12	Sandy loam	6	....	....	.36	1.93	94.09	.062	2.51	.050	.013	.105	....	....	25.87	20.87	14.73	31 61	.98	3.04
903		Near Choctaw Co. line	T 16, R 8 e, Sec 12	Subsoil of 902	12	....	....	.48	1.83	93.13	.065	4.16	.060	.020	.162	.015	....	24.67	19.71	12.95	28.80	3.13	8.32
904	Choctaw	Chas. Hemphill, French Camp	T 17, R 9 e, Sec 31	Branch bottom	6	....	500	1.03	4.82	87.27	.089	5.94	.160	.075	.249	.110	....	2.35	6.05	15.09	59.41	3 88	7.04
905		2½ mi ne French Camp	T 17, R 9 e, Sec 28	Surface	6	....	....	.62	3.05	90.61	.054	5.10	.050	.024	.177	.049	1.08	1.08	4 75	21.18	58.26	2.75	7.37
906		J D Perkins, Chester	T 17, R 10 e, Sec 3	Sandy loam	3	....	166	.72	3.59	89.53	.062	5.63	.105	.037	.197	.050	....	4.55	2.38	24.30	53.00	3.25	7.43
907		J D Perkins, Chester	T 17, R 10 e, Sec 3	Subsoil of 906	9	....	....	.72	3.86	86.07	.103	8.82	.080	.038	.240	.039	....	3.10	1 97	20.14	50.80	3.61	15.91
958		1 mi w of Vaiden, Carroll Co.	T 17, R 5 e, Sec 14	Brown silt	4	....	100	4.12	3.28	83.33	.062	8.13	.120	.080	.303	....	....	1.27	2.13	22.31	49.45	2.78	14.20

959	Carroll	1 mi w of Vaiden	T 17, R 5 e, Sec 14	Subsoil of 958	12			5.92	4.21	76.93	.042	11.66	.075	.111	.522			.78	1.33	15.02	50.04	3.40	19.18
960		W I Stone, 5 mi w of Vaiden	T 17, R 4 e, Sec 12	Bottom, Peachahaly	10		375	2.67	3.10	87.35	.065	6.03	.135	.188	.276			.139	2.16	19.19	60.74	2.43	8.00
961		W I Stone, 5 mi w of Vaiden	T 17, R 4 e, Sec 12	Second bottom	5	30		5.15	3.97	84.60	.125	5.43	.160	.104	.222			2.40	1.96	23.31	54.89	2.60	5.63
962		W I Stone, 5 mi w of Vaiden	T 17, R 4 e, Sec 12	Subsoil of 961				3.02	2.72	86.47	.125	6.85	.105	.092	.236			1.82	1.06	15.98	61.08	2.89	10.83
963		Ramsey Heggie, 6 mi w Vaiden	T 17, R 4 e, Sec 9	Brown loam	4		250	2.05	2.41	90.03	.100	4.68	.100	.051	.298	.064		.91	1.78	31.84	50.77	2.64	7.09
964		Ramsey Heggie, 6 mi w Vaiden	T 17, R 4 e, Sec 9	Subsoil of 963				5.90	3.70	79.80	.078	9.35	.105	.100	.480	.058	1.96	.48	.79	16.94	49.00	3.69	17.74
965		3 mi n of Carrollton	T 19, R 4 e, Sec 5	Brown loam	5			3.90	2.66	84.03	.094	8.02	.110	.078	.408	.020		.31	.44	17.26	56.42	3.84	15.14
966		3 mi n of Carrollton	T 19, R 4 e, Sec 5	Subsoil of 965	10			3.16	3.48	85.94	.045	6.62	.150	.079	.366			.53	.50	24.75	52.13	3.47	12.05
967		5 mi n of Carrollton	T 20, R 4 e, Sec 20	Brown loam	4	10		9.13	4.13	75.40	.045	10.27	.120	.090	.436			.26	.20	15.64	46.56	3.25	21.14
968		5 mi n of Carrollton	T 20, R 4 e, Sec 20	Subsoil of 967	10			4.77	5.20	82.70	.067	6.20	.350	.172	.322			1.28	2.13	12.92	56.75	7.03	9.54
969		3 mi ne of Grenada	T 21, R 4 e, Sec 28	Brown loam	6		100	2.77	2.87	89.43	.058	4.57	.125	.050	.170		1.30	1.23	2.23	30.20	47.78	2.73	8.60
970		3 mi ne of Grenada	T 21, R 4 e, Sec 28	Subsoil of 969	10			4.32	2.82	85.34	.063	6.76	.135	.025	.221			.80	1.35	16.36	56.72	3.92	15.71
971		4½ mi n of Coffeeville	T 25, R 6 e, Sec 10	Blackjack oak ridge	4	For	est	.90	2.18	92.06	.061	4.43	.015	.023	.180			1.82	19.64	27.85	37.59	2.65	7.50
972		4½ mi n of Coffeeville	T 25, R 6 e, Sec 10	Subsoil of 971	10			2.77	3.54	84.36	.067	8.54	.085	.035	.290			1.64	20.81	23.46	27.99	2.24	17.23
973		1 mi n of Water Valley	T 26, R 6 e, Sec 6	Blackjack oak ridge	8			3.32	3.22	84.45	.052	7.88	.065	.044	.311		.82	18.05	10.04	21.15	24.30	2.22	16.48
974		3 mi nw of Water Valley	T 27, R 6 e, Sec 32	Branch bottom	8		300	.68	1.75	93.35	.055	3.31	.140	.053	.212			13.36	16.49	29.70	32.55	.84	4.03
975		5 mi nw of Water Valley	T 27, R 6 e, Sec 28	Yocany creek bottom	10		366	1.50	2.57	90.32	.047	4.83	.145	.063	.223			8.50	9.80	23.93	44.31	2.10	6.18
976		Batesville		Brown loam	6		125	2.00	1.91	90.61	.091	4.46	.170	.102	.293			1.72	1.27	28.21	58.90	2.15	3.17
977		3 mi n of Batesville	T 8 s, R 7 w, Sec 35	Second bottom Tallahatchie	6		166	4.11	3.24	85.58	.095	5.95	.260	.168	.335			4.35	2.43	34.81	39.64	3.71	7.47
978		3 mi n of Batesville	T 8 s, R 7 w, Sec 35	Surface, Tal. bottom	6	10		3.96	2.73	86.56	.052	6.01	.130	.117	.333			2.30	1.48	41.82	37.98	2.60	6.86
979		5 mi n of Batesville	T 8 s, R 7 w, Sec 25	Brown loam	5		125	4.91	3.18	84.47	.090	6.67	.190	.070	.323			.79	.61	24.90	50.44	3.49	11.21
980		5 mi n of Batesville	T 8 s, R 7 w, Sec 25	Subsoil of 979				2.02	4.80	74.50	.063	11.96	.170	.136	.511			.29	.33	16.39	42.37	4.53	23.31
981		5 mi n of Batesville	T 8 s, R 7 w, Sec 25	(Forest) brown surface	5			2.84	3.46	86.90	.062	5.82	.170	.064	.426	.044		.69	.71	34.20	43.92	4.75	9.96
982		5 mi n of Batesville	T 8 s, R 7 w, Sec 25	Subsoil of 981	10			3.57	3.81	81.16	.071	9.97	.200	.102	.563	.052		.32	.28	27.05	40.92	5.02	19.35
983		3 mi s of Sardis	T 8 s, R 7 w, Sec 1	Brown loam	4	10		5.91	2.56	83.72	.064	6.38	.125	.064	.322	.054		.64	.73	30.00	45.10	3.59	11.65
984		3 mi s of Sardis	T 8 s, R 7 w, Sec 1	Subsoil of 983	10			3.92	3.50	81.62	.060	9.61	.120	.106	.470	.044		.20	.28	24.20	45.02	4.13	19.25
985		2 mi n of Sardis	T 7 s, R 7 w, Sec 15	Brown loam	5	10		2.67	2.02	89.10	.077	5.05	.185	.089	.373	.01		.94	1.07	30.72	51.65	2.94	6.96
986		2 mi n of Sardis	T 7 s, R 7 w, Sec 15	Subsoil of 985	10			4.04	2.92	82.44	.069	5.08	.160	.163	.430			.27	.58	24.42	47.10	4.38	17.10
987		2 mi n of Como	T 6 s, R 7 w, Sec 29	Clay subsoil	60			3.85	2.51	83.31	.092	9.20	.125	.151	.335			.52	.71	18.88	57.99	3.54	12.12
988		2 mi n of Como	T 6 s, R 7 w, Sec 29	Brown loam	7	15		3.29	3.47	87.20	.095	9.40	.120	.135	.304		4.00	2.05	2.22	35.59	43.43	1.66	4.56
989		2 mi n of Como	T 6 s, R 7 w, Sec 29	Subsoil of 988	12			2.31	2.81	86.69	.090	7.27	.100	.145	.320		1.06	1.18	.50	21.85	55.57	2.84	11.88
990		3 mi n of Como	T 6 s, R 7 w, Sec 6	Subsoil	60			3.00	3.52	83.08	.059	8.91	.210	.092	.472			.56	1.20	23.93	51.82	2.93	13.49
991		1 mi s of Senatobia	T 5 s, R 7 w, Sec 30	Brown loam	6		166	1.09	2.43	91.54	.050	4.19	.190	.066	.183			.50	.87	34.33	55.74	1.88	3.07
992		1 mi s of Senatobia	T 5 s, R 7 w, Sec 30	Subsoil of 991	12			1.36	3.03	89.30	.070	5.59	.220	.069	.329			.56	.95	34.44	49.33	3.59	7.02
993		Senatobia		Subsoil	60			3.35	3.05	83.58	.058	8.52	.265	.108	.439			.38	.61	24.03	52.81	2.76	13.11
994		1 mi n of Senatobia	T 5 s, R 7 w, Sec 19	Brown loam	7	25		4.32	2.27	88.74	.064	3.94	.140	.055	.241		1.10	.49	.66	32.44	52.90	1.38	4.92
995		1 mi n of Senatobia	T 5 s, R 7 w, Sec 19	Subsoil of 994	12			1.96	2.27	90.32	.111	4.72	.130	.061	.270		1.85	.90	.65	17.76	60.05	2.36	7.66
996		2 mi s of Coldwater	T 5 s, R 7 w, Sec 5	Brown loam	6	15		6.35	2.46	86.21	.210	4.17	.220	.064	.262			.41	.34	16.21	53.55	3.79	18.54
996½		2 mi s of Coldwater	T 5 s, R 7 w, Sec 5	Subsoil of 996	12			4.39	3.40	81.50	.090	8.92	.150	.132	.444		2.15	.54	.22	26.51	41.22	3.28	18.45
997		3 mi e of Coldwater	T 4 s, R 7 w, Sec 25	Brown loam valley	10	30		1.47	2.30	90.57	.086	4.77	.165	.071	.303			.14	.60	27.45	60.73	1.68	5.15
998		4 mi e of Coldwater	T 4 s, R 7 w, Sec 24	Subsoil	96			2.90	4.57	81.39	.071	11.76	.160	.033	.271			50.56	12.50	1.15	7.27	2.93	20.09
999		4 mi e of Coldwater	T 4 s, R 7 w, Sec 24	Subsoil	60			1.65	2.25	88.49	.060	6.79	.265	.068	.274		.71	13.55	1.55	20.88	45.77	4.38	9.95
1000		4 mi e of Coldwater	T 4 s, R 7 w, Sec 24	Surface	6			4.03	3.61	79.51	.210	10.91	.050	.097	.43			.44	.31	17.92	50.62	4.47	18.51
1001		3 mi e of Independence	T 4 s, R 5 w, Sec 29	Brown loam	4	10		1.93	3.20	88.38	.14	5.89	.15	.069	.26			1.13	1.18	27.55	55.78	3.00	6.96
1002		3 mi e of Independence	T 4 s, R 5 w, Sec 29	Subsoil of 1001	10			5.49	4.11	87.54	.14	6.85	.155	.028	.281			.44	.47	17.20	50.35	4.54	18.21
1003		3 mi e of Wall Hill	T 4 s, R 5 w, Sec 24	Surface	6		166	1.90	3.08	87.86	.076	6.20	.300	.041	.253			2.56	1.92	22.84	54.75	4.51	8.69
1004		3 mi e of Wall Hill	T 4 s, R 5 w, Sec 24	Subsoil of 1003	12			5.16	3.67	79.48	.21	10.28	.145	.058	.428		3.00	2.26	1.09	18.50	46.08	5.30	15.55
1005		2 mi e of Orion	T 4 s, R 4 w, Sec 23	Red subsoil	96			2.10	2.30	88.93	.05	6.52	.14	.066	.246			60.53	13.29	2.80	3.13	.79	15.21
1006		2 mi e of Orion	T 4 s, R 4 w, Sec 23	Red subsoil	48			1.86	1.66	90.03	.058	5.69	.125	.047	.265			34.82	9.90	13.76	24.15	1.73	11.84
1007		2 mi e of Orion	T 4 s, R 4 w, Sec 23	Surface	8		166	5.74	2.87	81.85	.052	8.24	.225	.083	.360			1.07	.48	20.64	48.89	4.17	16.18
1008		4 mi nw Holly Springs	T 4 s, R 3 w, Sec 9	Surface	5		166	3.03	3.22	87.92	.080	4.87	.275	.079	.252			2.44	1.42	20.26	57.34	5.03	7.01
1009		4 mi nw Holly Springs	T 4 s, R 3 w, Sec 9	Subsoil of 1008	10			3.62	2.73	85.12	.097	7.30	.240	.074	.344			1.32	.56	15.00	57.86	4.30	14.89

Soils of the Brown and Yellow Loam Region.

Lab. No.	County.	Location of Land; Address of Owner.	Township, Range and Section.	Character of Soil.	Showing Depth in In. Sample was Taken.	APPROX. Yield per Acre Unfertilized		Chemical Analysis.									Physical Analysis.						
						Corn in Bushels	Cotton, lbs., lint.	Moisture.	Volatile and Organic Matter.	Insoluble Matter.	Soluble Silica.	Iron & Aluminum Oxide.	Calcium Oxide (Lime).	Phosphoric Acid.	Potash.	Nitrogen.	Gravel.	Sand.	Fine Sand.	Very Fine Sand.	Silt.	Fine Silt.	Clay.
1021	Amite	W. B. Mercier, 3 mi e Centrev..	.....	Brown loam.....	....	....	....	10.19	2.98	83.07	.06	3.92	.095	.055	.125	.....	.....	7.08	2.37	19.15	52.97	2.13	3.03
1022		W. B. Mercier, 3 mi e Centrev..	.....	Subsoil of 1021.....	..	....	....	4.11	3.00	79.42	.043	7.33	.08	.048	.309	.....	....	6.50	1.78	15.26	49.96	6.75	12.72
1023		W. B. Mercier, 3 mi e Centrev..	.....	Surface soil.....	..	....	....	18.00	4.80	73.10	.064	3.16	.175	.057	.17	.. .	....	8.59	4.86	17.69	41.66	1.90	2.34
1024		W. B. Mercier, 3 mi e Centrev..	.....	Subsoil of 1023	....	....	....	13.23	4.34	74.19	.065	7.50	.095	.059	.401	.....	.....	6.49	3.06	15.02	44.39	2.09	11.87
1025		W. B. Mercier, 3 mi e Centrev.	.....	Crayfish bottom.....	....	....	....	9.04	3.67	81.83	.061	5.06	.125	.057	.242	.....	.....	3.10	3.16	24.27	48.45	1.93	5.75
1025½		W. B. Mercier, 3 mi e Centrev..	....	Subsoil of 1025.....	....	....	....	10.81	3 96	77.52	.069	6.30	.155	.064	.24	.....	.....	4.62	5.13	18.90	45.59	2.48	7.58
1026		J. A. Redhead, 3 mi s Centrev..	.....	Brown loam	....	....	250	6.90	2.26	85.29	.047	3.69	.08	.033	.166	.....	.....	12.09	9.31	21.27	39.13	1.62	5.90
1027		J. A. Redhead, 3 mi s Centrev..	....	Subsoil of 1026.....	....	....	....	8.56	2.62	82.12	.074	6.42	.125	.041	.28	.....	.....	10.44	6.60	15.60	43.27	3.15	9.96
871	Hinds.	2 mi n of Jackson.....	T 6, R 1 e, Sec 28.....	Yellow loam	4	5	....	.64	2.92	91.59	.102	4.08	.190	.040	.168	.....	....	.99	1.38	25.92	61.70	2.05	4.81
872		2 mi n of Jackson.	T 6, R 1 e, Sec 28.....	Subsoil of 871.....	10	....	....	1.27	3.55	85.81	.085	8.35	.140	.052	.336	.....	.....	.65	.59	17.24	57.99	4.05	15.10
873		... .	T 6, R 1 e, Sec 4	Branch bottom.	6	....	250	.83	3.80	89.41	.114	5.21	.210	.057	.182	.....	.....	2.82	3.66	16.34	67.04	2.39	3.13
874		....	T 6, R 1 e, Sec 4	Subsoil of 873.....	12	....	....	.59	2.11	92.43	.099	4.20	.140	.041	.165	...	.....	.47	.97	26.87	61.01	2.00	6.78
875		Near Madison county line.....	T 6, R 1 e, Sec 4	Brown (pasture)	8	....	....	.76	2.97	89.29	.071	6.15	.105	.050	.277	.050	5.80	1.51	1.22	26.45	50.98	2.13	7.34

Sundry Types of Soils Mainly from Southern Part of State.

Lab. No.	County.	Location of Land; Address of Owner.	Township, Range and Section.	Character of Soil.	Showing Depth in In. Sample was Taken.	Approx. Yield per Acre Unfertilized. Corn, in Bushels.	Cotton, lbs., lint.	Chemical Analysis. Moisture.	Volatile and Organic Matter.	Insoluble Matter.	Soluble Silica.	Iron and Alumina Oxide.	Calcium Oxide	Phosphoric Acid.	Potash.	Nitrogen.	Physical Analysis. Gravel.	Sand.	Fine Sand.	Very Fine Sand.	Silt.	Fine Silt.	Clay.
834	Neshoba.	C. W. Cannon	T 10, R 10 e, Sec 2	Surface gray loam	4	...	333	.56	3.49	89.33	.130	5.36	.075	.052	.170	.080	2.82	37.16	9.06	10.58	30.84	1.85	3.2
835		C. W. Cannon	T 10, R 10 e, Sec 2	Red subsoil	12	...	...	1.23	3.14	82.85	.080	11.56	.225	.061	.347	.035	1.79	29.21	7.33	8.52	28.94	2.66	16.5
836		J. M. Cooper, Dixon	T 9, R 11 e, Sec 6	Stiff basin	10	40	...	1.45	4.20	85.80	.132	6.92	.165	.087	.247	.104	.....	9.26	7.58	6.47	58.74	3.95	7.5
837		J. M. Cooper, Dixon	T 9, R 11 e, Sec 6	Subsoil of 836	15	...	...	3.15	3.41	84.37	.128	7.93	.170	.077	.287	.095	.....	12.25	9.83	7.24	46.87	4.07	12.6
838		J. M. Cooper, Dixon	T 9, R 11 e, Sec 6	Sandy basin	6	...	200	.24	1.32	95.44	.100	2.40	.080	.045	.163	.042	.....	35.90	18.50	3.07	34.75	3.54	1.9
839		J. M. Cooper, Dixon	T 9, R 11 e, Sec 6	Subsoil of 838	10	...	...	1.21	3.11	86.65	.062	7.62	.160	.036	.180	.050	.....	20.03	10.85	4.87	41.46	3.43	14.8
853		R. H. Campbell, Harpersville	T 8, R 8 e, Sec 22	Stiff Basin	12	40	...	.70	4.27	87.48	.057	6.37	.235	.097	.270	.085	.....	11.59	4.51	14.14	56.74	2.62	4.9
854		R. H. Campbell, Harpersville	T 8, R 8 e, Sec 22	Subsoil of 853	15	...	...	1.27	3.55	85.02	.062	8.97	.20	.073	.324	.....	.....	16.31	5.87	9.99	44.91	3.78	14.3
855		R. H. Campbell, Harpersville	T 8, R 8 e, Sec 22	Brown sandy basin	4	25	...	.30	2.34	91.40	.035	5.75	.10	.044	.210	.....	.....	36.12	11.29	9.88	29.76	1.99	8.1
856		R. H. Campbell, Harpersville	T 8, R 8 e, Sec 22	Branch bottom	4	...	500	1.23	4.72	85.94	.086	6.67	.20	.058	.309	.10	....	2.81	5.50	15.45	63.65	2.47	3.9
857		R. H. Campbell, Harpersville	T 8, R 8 e, Sec 22	Subsoil of 856	12	...	...	1.08	4.15	87.67	.140	5.16	.103	.041	.223	.08	4.28	6.22	18.62	14.70	42.80	2.10	5.8
848		Lewis Lyle, Cash	T 8, R 7 e, Sec 3	Crayfish bottom	12	...	...	.41	2.02	94.10	.192	3.01	.095	.025	.190	.05	..	14.11	22.92	11.57	43.53	.72	3.9
849		Lewis Lyle, Cash	T 8, R 7 e, Sec 3	Very sandy	24	...	166	1.34	6.34	84.20	.150	7.14	.285	.066	.202	.120	..	15.39	27.10	18.11	26.37	2.02	3.0
850		Lewis Lyle, Cash	T 8, R 7 e, Sec 3	Loam, typical for section	4	15	...	.27	2.62	94.25	.054	2.38	.135	.049	.150	.07	.	7.46	25.60	19.41	40.66	1.34	2.2
851		Lewis Lyle, Cash	T 8, R 7 e, Sec 3	Subsoil of 850	10	...	...	.76	4.19	83.73	.070	10.31	.165	.049	.283	.048	...	4.31	13.26	13.29	44.48	3.55	15.8
840	Scott and Newsha.	R. E. Majare, High Hill	T 9, R 10 e, Sec 6	Burned reedbrake	12	...	...	4.01	2.45	83.15	.071	8.95	.310	.284	.300	.065	.....	13.05	18.13	11.17	43.90	2.96	3.8
841		R. E. Majare, High Hill	T 9, R 10 e, Sec 6	Spongy reedbrake	12	75	...	11.10	28.58	52.15	.082	4.60	.100	.129	.267	.....	.....	8.88	9.96	5.14	24.97	1.94	9.6
842		R. E. Majare, High Hill	T 9, R 10 e, Sec 6	Timbered reedbrake	12	75	...	1.76	7.28	87.69	.076	2.57	.060	.041	.163	.20	.....	7.42	13.76	16.01	45.62	1.89	6.4
843		R. E. Majare, High Hill	T 9, R 9 e, Sec 2	Timbered reedbrake	12	75	...	2.02	8.18	84.75	.119	4.96	.125	.064	.173	.....	.....	7.04	20.20	11.03	41.07	2.76	6.2
844		Irvin Miller, Walnut Grove	T 9, R 8 e, Sec 23	Sandy loam	4	...	150	1.46	3.65	88.15	.106	6.19	.205	.050	.189	.....	.....	3.17	17.69	17.85	42.01	3.00	11.1
845		Irvin Miller, Walnut Grove	T 9, R 8 e, Sec 23	Subsoil of 844	7	...	...	3.45	4.47	79.83	.108	11.66	.210	.038	.280	.....	.....	1.81	15.93	13.99	39.49	5.96	14.7
846		2½ mi sw Walnut Grove	T 9, R 8 e, Sec 34	Sandy-loam bottom	10	...	500	.84	2.96	92.68	.124	3.20	.170	.048	.165	.....	.....	3.26	24.89	15.51	39.47	4.00	9.0
847		2½ mi sw Walnut Grove	T 9, R 8 e, Sec 34	Subsoil of 846	18	...	...	.89	2.11	92.23	.228	4.26	.055	.049	.236	.....	.....	11.74	31.55	11.59	31.93	3.37	7.2
852		Mr. Mapp, Harp's'lle, Scott Co		Branch bottom	..	...	...	.12	1.67	95.07	.057	2.53	.085	.032	.130	.05	.....	1.85	53.07	17.50	21.52	1.03	2.7
954		2 mi se Fair Ground, Nesh' Co	T 10, R e, Sec 30	"Rawhide" land	3	...	...	4.96	10.30	45.61	.122	37.32	.360	.117	.563	.....	.....	18.42	8.74	4.55	8.56	4.58	40.5
955		2 mi se Fair Ground, Nesh' Co	T 10, R e, Sec 30	Subsoil of 954	6	...	...	4.17	6.04	62.59	.088	24.61	.315	.195	.616	.....	.....	18.18	5.10	6.98	15.07	3.50	40.4
801	Copiah.	J. J. Pritchett, Crystal Sprngs	T 12, R 1 w, Sec 30	Light silt-loam	6	...	500	1.05	4.06	87.45	.13	6.20	.15	.064	.203	.075	3.22	3.28	3.82	8.98	65.86	2.16	6.7
802		J. J. Pritchett, Crystal Sprngs	T 12, R 1 w, Sec 30	Subsoil of 801	12	...	...	1.72	4.47	81.70	.10	10.81	.11	.08	.323	.060	.31	2.33	1.52	5.96	63.48	3.11	15.8
803		J. J. Pritchett, Crystal Sprngs	T 12, R 1 w, Sec 30	Dark silt-loam	8	...	500	.90	3.35	89.73	.12	5.15	.075	.058	.223	.07	.24	7.76	3.78	8.02	65.94	2.63	6.8
804		J. J. Pritchett, Crystal Sprngs	T 12, R 1 w, Sec 30	Subsoil of 803	24	...	...	1.70	3.47	83.75	.06	9.79	.06	.106	.377	.05	.11	4.46	2.73	6.23	60.11	2.50	17.5
805		J. J. Pritchett, Crystal Sprngs	T 12, R 1 w, Sec 30	Light silt-loam	6	40	...	1.02	3.75	88.00	.07	6.30	.175	.064	.297	.07	.86	2.80	1.48	6.63	71.00	5.26	6.5
806		J. J. Pritchett, Crystal Sprngs	T 12, R 1 w, Sec 30	Subsoil of 805	18	...	...	2.22	3.82	82.36	.04	5.25	.10	.091	.390	.05	.....	1.04	1.97	3.23	67.16	3.15	16.9
807		J. W. Day, near Crystal Sprgs	T 12, R 2 w, Sec 34	Silt-loam, with gravel	8	...	...	.99	5.67	88.93	.196	3.51	.175	.061	.190	.....	3.17	6.86	1.93	18.47	57.20	2.22	3.8
808		J. W. Day, near Crystal Sprgs	T 12, R 2 w, Sec 34	Subsoil of 807	15	...	...	1.89	4.42	82.60	.158	10.02	.100	.054	.277	.01	.90	3.98	.67	11.49	52.23	3.15	21.5
809		J. W. Day, near Crystal Sprgs	T 12, R 2 w, Sec 34	Dark silt-loam	7	...	...	.76	4.67	90.57	.182	3.35	.140	.040	.170	.075	1.44	6.01	1.88	14.23	64.64	2.35	3.8
810		H. B. Day, near Crystal Sprgs	T 12, R 2 w, Sec 28	Silt-loam	8	...	...	2.06	3.66	84.24	.124	8.81	.145	.047	.286	.04	.....	2.50	3.24	17.60	54.50	8.14	8.7
811		H. B. Day, near Crystal Sprgs	T 12, R 2 w, Sec 28	Silt-loam	6	...	...	.96	4.55	90.05	.158	3.50	1.20	.068	.263	.095	.18	9.21	7.56	14.35	57.28	3.18	3.2
812		G. R. Gwanet, 4 mi w "	T 12, R 2 w, Sec 31	Subsoil of bottom	15	...	...	.77	2.48	91.39	.154	4.40	.135	.095	.197	.048	.....	11.25	9.32	10.98	52.25	6.07	6.8

Soils of the Brown and Yellow Loam Region.

Lab. No.	County.	Location of Land; Address of Owner.	Township, Range and Section.	CHARACTER OF SOIL.	Showing Depth in In. Sample was Taken.	APPROX. Yield per Acre Unfertilized		Chemical Analysis.									Physical Analysis.						
						Corn in Bushels	Cotton, lbs. lint.	Moisture.	Volatile and Organic Matter.	Insoluble Matter.	Soluble Silica.	Iron & Alumnum Oxide.	Calcium Oxide (Lime).	Phosphoric Acid.	Potash.	Nitrogen.	Gravel.	Sand.	Fine Sand.	Very Fine Sand.	Silt.	Fine Silt.	Clay.
1021	Amite	W. B. Mercier, 3 mi e Centrev		Brown loam				10.19	2.98	83.07	.06	3.92	.095	.055	.125			7.08	2.37	19.15	52.97	2.13	3.03
1022		W. B. Mercier, 3 mi e Centrev		Subsoil of 1021				4.11	3.00	79.42	.043	7.33	.08	.048	.309			6.50	1.78	15.26	49.96	6.75	12.72
1023		W. B. Mercier, 3 mi e Centrev		Surface soil				18.00	4.80	73.10	.064	3.16	.175	.067	.17			8.59	4.86	17.69	41.66	1.90	2.34
1024		W. B. Mercier, 3 mi e Centrev		Subsoil of 1023				13.23	4.34	74.19	.065	7.50	.095	.059	.401			6.49	3.06	15.02	44.39	2.09	11.87
1025		W. B. Mercier, 3 mi e Centrev		Crayfish bottom				9.04	3.67	81.83	.061	5.06	.125	.057	.242			3.10	3.16	24.27	48.45	1.93	5.75
1025½		W. B. Mercier, 3 mi e Centrev		Subsoil of 1025				10.81	3.96	77.52	.069	6.30	.155	.064	.24			4.62	5.13	18.90	45.59	2.48	7.58
1026		J. A. Redhead, 3 mi s Centrev		Brown loam			250	6.90	2.26	85.29	.047	3.69	.08	.033	.166			12.09	9.31	21.27	39.13	1.62	5.90
1027		J. A. Redhead, 3 mi s Centrev		Subsoil of 1026				8.56	2.62	82.12	.074	6.42	.125	.041	.28			10.44	6.60	15.60	43.27	3.15	9.96
871	Hinds.	2 mi n of Jackson	T 6, R 1 e, Sec 28	Yellow loam	4	5		.64	2.92	91.59	.102	4.08	.190	.040	.168			.99	1.38	25.92	61.70	2.05	4.81
872		2 mi n of Jackson	T 6, R 1 e, Sec 28	Subsoil of 871	10			1.27	3.55	85.81	.085	8.35	.140	.052	.336			.65	.59	17.24	57.99	4.05	15.10
873			T 6, R 1 e, Sec 4	Branch bottom	6		250	.83	3.80	89.41	.114	5.21	.210	.057	.182			2.82	3.66	16.34	67.04	2.39	3.13
874			T 6, R 1 e, Sec 4	Subsoil of 873	12			.59	2.11	92.43	.099	4.20	.140	.041	.165			.47	.97	26.87	61.01	2.00	6.78
875		Near Madison county line	T 6, R 1 e, Sec 4	Brown (pasture)	8			.76	2.97	89.29	.071	6.15	.105	.050	.277	.050	5.80	1.51	1.22	26.45	50.98	2.13	7.34

Sundry Types of Soils Mainly from Southern Part of State.

Lab. No.	County.	Location of Land; Address of Owner.	Township, Range and Section.	Character of Soil.	Showing Depth in In. Sample was Taken.	Approx. Yield per Acre Unfertilized. Corn, in Bushels.	Cotton, lbs., lint.	Chemical Analysis. Moisture.	Volatile and Organic Matter.	Insoluble Matter.	Soluble Silica.	Iron and Alumina Oxide.	Calcium Oxide	Phosphoric Acid.	Potash.	Nitrogen.	Physical Analysis. Gravel.	Sand.	Fine Sand.	Very Fine Sand.	Silt.	Fine Silt.	Clay.
834	Neshoba.	C. W. Cannon	T 10, R 10 e, Sec 2	Surface gray loam	4	...	333	.56	3.49	89.33	.130	5.36	.075	.052	.170	.080	2.82	37.16	9.06	10.58	30.84	1.85	3.2
835		C. W. Cannon	T 10, R 10 e, Sec 2	Red subsoil	12	...	...	1.23	3.14	82.85	.080	11.56	.225	.061	.347	.035	1.79	29.21	7.33	8.52	28.94	2.66	16.5
836		J. M. Cooper, Dixon	T 9, R 11 e, Sec 6	Stiff basin	10	40	....	1.45	4.20	85.80	.132	6.92	.165	.087	.247	.104	.....	9.26	7.58	6.47	58.74	3.95	7.5
837		J. M. Cooper, Dixon	T 9, R 11 e, Sec 6	Subsoil of 836	15	....	....	3.15	3.41	84.37	.128	7.93	.170	.077	.287	.095	.....	12.25	9.83	7.24	46.87	4.07	12.6
838		J. M. Cooper, Dixon	T 9, R 11 e, Sec 6	Sandy basin	6	....	200	.24	1.32	95.44	.100	2.40	.080	.045	.163	.042	.....	35.90	18.50	3.07	34.75	3.54	1.9
839		J. M. Cooper, Dixon	T 9, R 11 e, Sec 6	Subsoil of 838	10	....	....	1.21	3.11	86.65	.062	7.62	.160	.036	.180	.050	.....	20.03	10.85	4.87	41.46	3.43	14.8
853	Scott	R. H. Campbell, Harpersville	T 8, R 8 e, Sec 22	Stiff Basin	12	40	....	.70	4.27	87.48	.057	6.37	.235	.097	.270	.085	.....	11.59	4.51	14.14	56.74	2.62	4.9
854		R. H. Campbell, Harpersville	T 8, R 8 e, Sec 22	Subsoil of 853	15	....	....	1.27	3.55	85.02	.062	8.97	.20	.073	.324	.....	.....	16.31	5.87	9.99	44.91	3.78	14.3
855		R. H. Campbell, Harpersville	T 8, R 8 e, Sec 22	Brown sandy basin	4	25	....	.30	2.34	91.40	.035	5.75	.10	.044	.210	.....	.....	36.12	11.29	9.88	29.76	1.99	8.1
856		R. H. Campbell, Harpersville	T 8, R 8 e, Sec 22	Branch bottom	4	....	500	1.23	4.72	85.94	.086	6.67	.20	.058	.309	.10	.....	2.81	5.50	15.45	63.65	2.47	3.9
857		R. H. Campbell, Harpersville	T 8, R 8 e, Sec 22	Subsoil of 856	12	....	....	1.08	4.15	87.67	.140	5.16	.103	.041	.223	.08	4.28	6.22	18.62	14.70	42.80	2.10	5.8
848		Lewis Lyle, Cash	T 8, R 7 e, Sec 3	Crayfish bottom	12	....	....	.41	2.02	94.10	.192	3.01	.095	.025	.190	.05	..	14.11	22.92	11.57	43.53	.72	3.9
849		Lewis Lyle, Cash	T 8, R 7 e, Sec 3	Very sandy	24	....	166	1.34	6.34	84.20	.150	7.14	.285	.066	.202	.120	..	15.39	27.10	18.11	26.37	2.02	3.0
850		Lewis Lyle, Cash	T 8, R 7 e, Sec 3	Loam, typical for section	4	15	....	.27	2.62	94.25	.054	2.38	.135	.049	.150	.07	.	7.46	25.60	19.41	40.66	1.34	2.2
851		Lewis Lyle, Cash	T 8, R 7 e, Sec 3	Subsoil of 850	10	....	....	.76	4.19	83.73	.070	10.31	.165	.049	.283	.048	...	4.31	13.26	13.29	44.48	3.55	15.8
840		R. E. Majare, High Hill	T 9, R 10 e, Sec 6	Burned reedbrake	12	....	....	4.01	2.45	83.15	.071	8.95	.310	.284	.300	.065	.....	13.05	18.13	11.17	43.90	2.96	3.8
841		R. E. Majare, High Hill	T 9, R 10 e, Sec 6	Spongy reedbrake	12	75	...	11.10	28.58	52.15	.082	4.60	.100	.129	.267	....	.....	8.88	9.96	5.14	24.97	1.94	9.6
842		R. E. Majare, High Hill	T 9, R 10 e, Sec 6	Timbered reedbrake	12	75	...	1.76	7.28	87.69	.076	2.57	.060	.041	.163	.20	.....	7.42	13.76	16.01	45.62	1.89	6.4
843		R. E. Majare, High Hill	T 9, R 9 e, Sec 2	Timbered reedbrake	12	75	..	2.02	8.18	84.75	.119	4.96	.125	.064	.173	....	.....	7.04	20.20	11.03	41.07	2.76	6.2
844		Irvin Miller, Walnut Grove	T 9, R 8 e, Sec 23	Sandy loam	4	....	150	1.46	3.65	88.15	.106	6.19	.205	.050	.189	....	.....	3.17	17.69	17.85	42.01	3.00	11.1
845		Irvin Miller, Walnut Grove	T 9, R 8 e, Sec 23	Subsoil of 844	7	....	....	3.45	4.47	79.83	.108	11.66	.210	.038	.280	....	.....	1.81	15.93	13.99	39.49	5.96	14.7
846		2½ mi sw Walnut Grove	T 9, R 8 e, Sec 34	Sandy-loam bottom	10	....	500	.84	2.96	92.68	.124	3.20	.170	.048	.165	....	.....	3.26	24.89	15.51	39.47	4.00	9.0
847		2½ mi sw Walnut Grove	T 9, R 8 e, Sec 34	Subsoil of 846	18	....	....	.89	2.11	92.23	.228	4.26	.055	.049	.236	....	.....	11.74	31.55	11.59	31.93	3.37	7.2
852		Mr. Mapp, Harp's'lle, Scott Co		Branch bottom	..	....	....	.12	1.67	95.07	.057	2.53	.085	.032	.130	.05	.....	1.85	53.07	17.50	21.52	1.03	2.7
954		2 mi se Fair Ground, Nesh' Co	T 10, R e, Sec 30	"Rawhide" land	3	....	....	4.96	10.30	45.61	.122	37.32	.360	.117	.563	....	.....	18.42	8.74	4.55	8.56	4.58	40.5
955		2 mi se Fair Ground, Nesh' Co	T 10, R e, Sec 30	Subsoil of 954	6	....	....	4.17	6.04	62.59	.088	24.61	.315	.195	.616	....	.....	18.18	5.10	6.98	15.07	3.50	40.4
801	Leake	J. J. Pritchett, Crystal Springs	T 12, R 1 w, Sec 30	Light silt-loam	6	....	500	1.05	4.06	87.45	.13	6.20	.15	.064	.203	.075	3.22	3.28	3.82	8.98	65.86	2.16	6.7
802		J. J. Pritchett, Crystal Springs	T 12, R 1 w, Sec 30	Subsoil of 801	12	....	....	1.72	4.47	81.70	.10	10.81	.11	.08	.323	.060	.31	2.33	1.52	5.96	63.49	3.11	15.8
803		J. J. Pritchett, Crystal Springs	T 12, R 1 w, Sec 30	Dark silt-loam	8	....	500	.90	3.35	89.73	.12	5.15	.075	.058	.223	.07	.24	7.76	3.78	8.02	65.94	2.63	6.8
804		J. J. Pritchett, Crystal Springs	T 12, R 1 w, Sec 30	Subsoil of 803	24	....	....	1.70	3.47	83.75	.06	9.79	.06	.106	.377	.05	.11	4.46	2.73	6.23	60.11	2.50	17.5
805		J. J. Pritchett, Crystal Springs	T 12, R 1 w, Sec 30	Light silt-loam	6	40	....	1.02	3.75	88.00	.07	6.30	.175	.064	.297	.07	.86	2.80	1.48	6.63	71.00	5.26	6.5
806		J. J. Pritchett, Crystal Springs	T 12, R 1 w, Sec 30	Subsoil of 805	18	....	....	2.22	3.82	82.36	.04	5.25	.10	.091	.390	.05	.....	1.04	1.97	3.23	67.16	3.15	16.9
807	Copiah	J. W. Day, near Crystal Sprgs	T 12, R 2 w, Sec 34	Silt-loam, with gravel	8	....	....	.99	5.67	88.93	.196	3.51	.175	.061	.190	.....	3.17	6.86	1.93	18.47	57.20	2.22	3.8
808		J. W. Day, near Crystal Sprgs	T 12, R 2 w, Sec 34	Subsoil of 807	15	....	....	1.89	4.42	82.60	.158	10.02	.100	.054	.277	.01	.90	3.98	.67	11.49	52.23	3.15	21.5
809		J. W. Day, near Crystal Sprgs	T 12, R 2 w, Sec 34	Dark silt-loam	7	....	....	.76	4.67	90.57	.182	3.35	.140	.040	.170	.075	1.44	6.01	1.88	14.23	64.64	2.35	3.8
810		H. B. Day, near Crystal Sprgs	T 12, R 2 w, Sec 28	Silt-loam	8	....	....	2.06	3.66	84.24	.124	8.81	.145	.047	.286	.04	.....	2.50	3.24	17.60	54.50	8.14	8.7
811		H. B. Day, near Crystal Sprgs	T 12, R 2 w, Sec 28	Silt-loam	6	....	.....	.96	4.55	90.05	.158	3.50	1.20	.068	.263	.095	.18	9.21	7.56	14.35	57.28	3.18	3.2
812		G. R. Gwanet, 4 mi w " "	T 12, R 2 w, Sec 31	Subsoil of bottom	15	....	....	.77	2.48	91.39	.154	4.40	.135	.095	.197	.048	.....	11.25	9.32	10.98	52.25	6.07	6.8

Sundry Types of Soils Mainly from Southern Part of State.

Lab. No.	County.	Location of Land; Address of Owner.	Township, Range and Section.	Character of Soil.	Showing Depth in In. Sample was Taken.	APPROX. Yield per Acre Unfertilized: Corn in Bushels	APPROX. Yield per Acre Unfertilized: Cotton, lbs. lint.	Chemical Analysis. Moisture	Volatile and Organic Matter.	Insoluble Matter.	Soluble Silica.	Iron & Aluminum Oxide.	Calcium Oxide.	Phosphoric Acid.	Potash.	Nitrogen.	Physical Analysis. Gravel.	Sand.	Fine Sand.	Very Fine Sand.	Silt.	Fine Silt.	Clay.
813		T. P. Hutchinson, 2 mi s Crys S	T 11, R 2 w, Sec 1	Silt-loam, very light	6			.86	3.29	74.03	.146	3.76	.070	.05	.173	.06	.....	5.45	8.01	11.81	59.52	2.75	8.29
814		T. P. Hutchinson, 2 mi s Crys S	T 11, R 2 w, Sec 1	Subsoil of 813	15			2.48	4.04	80.29	.114	10.96	.025	.046	.303	.04	.....	1.82	3.11	7.24	57.36	3.78	19.01
816		N. L. Hutchinson, 2 mi se " "	T 11, R 1 w, Sec 6	Dark silt-loam	6			1.99	5.64	82.85	.182	7.04	.255	.107	.300	.125	.....	3.24	2.85	7.89	66.99	3.89	6.65
817		N. L. Hutchinson, 2 mi se " "	T 11, R 1 w, Sec 6	Subsoil of 816	15			1.51	2.94	87.66	.128	6.63	.085	.087	.296	.055	.....	5.48	1.97	9.06	67.86	4.37	6.76
818		W. Grantham, near Pearl Riv'r	T 2, R 1 e, Sec 30	Dark sandy-loam	6		500	2.16	6.26	83.10	.182	6.57	.225	.149	.196	.190	.92	8.19	27.80	19.82	28.86	2.79	2.53
819		W. Grantham, " " "	T 2, R 1 e, Sec 30	Subsoil of 818	15			2.00	2.89	87.78	.152	5.99	.075	.087	.223	.080	.13	4.60	28.79	18.38	29.50	5.89	7.84
820		W. Grantham, " " "	T 2, R 1 e, Sec 30	Sandy-silt-loam	60		250	.80	3.13	91.49	.140	3.61	.215	.081	.233	.080	.....	14.69	23.64	9.31	42.44	2.07	3.65
822		Dr. O. Dulany, Hopewell	T 1, R 1 e, Sec 7	Silt-loam	6			.54	3.28	92.71	.146	3.13	.155	.040	.200	.076	3.26	6.84	4.59	8.76	66.73	2.35	4.52
823		F. M. Barlow, Pearl riv. bot'm	T 1, R 1 e, Sec 9	Silt-loam	6		500	.57	2.15	92.69	.160	3.50	.120	.065	.277	.063	.....	16.21	10.64	2.21	58.11	4.48	6.72
824		W. A. Watkins, 2d bot. Pearl riv	T 1, R 1 e, Sec 15	Sandy-silt-loam	12			1.30	3.53	90.66	.240	3.10	.285	.050	.253	.110	.....	.32	15.86	32.63	34.37	5.11	7.64
825		W. A. Watkins, 13 mi e Crys. S.	T 1, R 1 e, Sec 15	Sandy-silt-loam	6		500	.56	2.06	94.13	.160	2.46	.100	.060	.251	.070	.....	5.87	36.88	12.51	37.68	1.10	2.82
826		W. A. Watkins, " " " " "	T 1, R 1 e, Sec 15	Silt-loam	6			1.02	2.96	90.50	.156	3.96	.150	.077	.262	.060	.....	10.79	13.81	6.26	55.37	2.74	6.99
827		2 mi n Georgetown	T 1, R 1 e, Sec 26	Sandy soil	8		100	.35	1.20	96.74	.154	1.15	.095	.064	.128	.049	.....	37.99	47.16	4.05	7.26	.69	1.02
828		W. O. Catchings, near Geo'twn	T 1, R 1 e, Sec 35	Sandy loam	18			.73	2.07	92.74	.158	3.48	.115	.047	.134	.050	3.54	17.84	29.64	9.31	26.48	4.95	4.72
829		W. O. Catchings, " "	T 1, R 1 e, Sec 34	Hammock subsoil	12			1.28	2.90	87.63	.152	6.87	.150	.040	.177	.055	1.39	2.75	4.03	20.57	55.60	3.78	7.66
830		W. D. Catchings	T 1, R 1 e, Sec 34	Typical Pearl river bottom	8		400	1.04	3.91	89.22	.110	5.02	.130	.060	.199	.125	.....	5.87	6.73	23.42	54.77	1.66	2.80
831		R. Coxwell	T 10, R 9 e, Sec 6	Silt-loam	8			.77	3.32	89.67	.118	4.71	.125	.064	.264	.090	.....	5.21	3.88	24.17	53.01	2.87	6.25
832		Dodds	T 11, R 2 w, Sec 22	New land	8			.78	4.04	90.93	.116	3.58	.125	.036	.132	.040	.....	18.37	9.57	14.01	47.89	2.35	2.93
1010	Copiah	W. C. Welborn, Mico	T 10, R 12 w, Sec 36	Pinewoods sandy land	.....	.....	.....	8.17	6.52	83.42	.13	1.42	.20	.046	.123	.....	.....	46.74	27.79	2.27	7.03	.38	.50
1011		W. C. Welborn, Mico	T 10, R 12 w, Sec 36	Subsoil of 1010	.....	.....	.....	2.97	2.46	92.59	.117	1.58	.100	.03	.106	.....	.....	52.56	29.92	2.28	7.91	.76	.83
1012		W. C. Welborn, Mico	T 10, R 12 w, Sec 36	Pinewoods sandy loam	.....	.....	.....	5.47	3.45	86.84	.10	3.63	.15	.035	.160	.....	.....	24.01	23.99	13.28	27.84	1.34	2.06
1013		W. C. Welborn, Mico	T 10, R 12 w, Sec 36	Subsoil of 1012	.....	.....	.....	8.40	2.51	82.80	.07	5.62	.11	.024	.208	.....	.....	19.88	18.28	12.95	30.73	2.90	3.30
674		Big Level, Harrison County	T 3 s, R 10 w,	Pinewoods loam	.....	.....	.....	.68	5.06	89.27	.....	4.60	.18	.033	.098	.....	.....	44.18	18.64	5.77	25.76	3.97	6.06
675		Big Level, Harrison County	T 3 s, R 10 w,	Subsoil of 674	.....	.....	.....	.74	3.71	87.68	.270	7.46	.12	.025	.106	.....	.....	22.35	25.17	4.68	30.81	3.11	10.00
913		2 mi Perkinsville	T 14, R 14 e, Sec 5	Basin land	12		166	1.11	3.27	88.82	.057	3.20	.155	.044	.160	.050	.....	4.89	5.14	12.10	64.80	2.86	6.16
914		2 mi Perkinsville	T 14, R 14 e, Sec 5	Subsoil of 913	15			1.53	3.01	85.85	.054	8.54	.145	.028	.303	.....	.....	9.03	6.17	9.43	50.30	4.53	16.30
915	Winston	2 mi n Handle	T 13, R 14 e, Sec 28	Basin land	4		333	1.11	3.36	89.08	.072	4.24	.160	.055	.145	.050	.....	8.78	7.85	19.67	52.47	2.50	4.00
916		2 mi n Handle	T 13, R 14 e, Sec 28	Subsoil of 915	8			1.28	3.29	87.71	.076	7.39	.132	.039	.235	.....	.....	6.74	9.60	18.05	46.87	2.92	9.91
917		F. M. Ross, Herbert	T 10, R 13 e, Sec 36	Light Basin	4		166	.55	2.30	92.75	.047	3.76	.068	.074	.140	.045	.....	46.36	9.68	8.29	27.10	1.75	3.79
918		F. M. Ross, Herbert	T 10, R 13 e, Sec 36	Subsoil of 917	10			.82	2.50	90.72	.050	5.24	.150	.101	.201	.....	.....	45.68	6.41	6.97	26.27	2.85	8.18
919		F. M. Ross, Herbert	T 10, R 13 e, Sec 36	Stiff basin	4	40		1.07	3.88	87.76	.077	6.33	.130	.060	.199	.05	.....	3.74	2.10	5.81	74.31	3.11	5.80
920	Kemper	F. M. Ross, Herbert	T 10, R 13 e, Sec 36	Subsoil of 919	10			.64	3.30	87.97	.068	6.54	.070	.064	.227	.100	.....	26.41	8.05	5.66	43.71	3.02	8.72
911		3 mi s Louisville, Winston Co.	T 14, R 12 e, Sec 16	Sandy loam	4		125	.56	2.65	92.59	.058	3.56	.100	.022	.133	.048	.....	2.29	9.52	28.64	48.46	2.76	3.90
912		3 mi s Louisville, Winston Co.	T 14, R 12 e, Sec 16	Subsoil of 911	15			2.26	4.35	74.16	.069	13.17	.045	.033	.321	.030	.....	2.25	1.81	17.90	42.57	5.58	23.33
921		F. D. Dewes, Herbert, Nesh. Co	T 10, R 13 e, Sec	Sandy basin	5		125	.78	.56	96.11	.053	2.32	.020	.028	.090	.060	.36	68.78	5.71	6.52	13.76	.96	2.46
922		F D Dewes, Herbert, " "	T 10, R 13 e, Sec	Subsoil of 921	8			.97	2.21	91.04	.070	5.39	.065	.039	.160	.025	.41	46.93	3.92	6.53	27.95	1.77	.90
923		S. D. Stennis, Kemper Co	T 10, R 15 e, Sec 9	Gray sandy loam	4	15		.37	1.88	94.17	.078	2.59	.070	.019	.141	.035	.....	2.01	16.89	27.58	45.80	2.07	3.35
925		7 mi sw DeKalb, Kemper Co	T 10, R 15 e, Sec 11	Rawhide	3			6.73	8.12	68.35	.113	15.40	.170	.029	.345	.050	.....	13.83	9.55	2.20	19.04	8.68	32.18
858		4 mi n Forest	T 7, R 8 e, Sec 20	Flat sandy, pinewoods	6			.50	1.80	94.02	.180	2.58	.195	.013	.129	.025	.....	18.28	12.17	13.39	48.13	1.57	4.12
859		1 mi w Forest	T 6, R 8 e, Sec 17	Brown central prairie	3			4.56	8.62	73.50	.140	11.57	.725	.029	.255	.140	.....	12.56	6.05	7.02	39.70	7.51	13.28
860	Scott	1 mi w Forest	T 6, R 8 e, Sec 17	Subsoil of 859	8			5.87	6.73	66.34	.244	17.68	.595	.030	.486	.105	.....	7.59	6.19	7.50	35.56	8.82	22.03

861	Rankin	2 mi w Pelahatchie	T 5, R 5 e, Sec 6	Loam	8			1.11	3.94	88.59	.108	5.19	.220	.052	.290	.140		6.18	21.97	24.02	39.29	1.47	2.70
862		4 mi s Brandon	T 5, R 3 e, Sec 29	Sandy loam	3		125	.87	3.22	90.54	1.54	4.33	.185	.040	.194	.055		3.78	10.01	26.59	48.78	1.67	14.8
863		4 mi s Brandon	T 5, R 3 e, Sec 29	Subsoil of 862	8			1.51	4.29	81.58	.072	11.00	.260	.054	.370	.050		1.58	3.64	21.44	43.76	3.77	19.9
864		4 mi s Brandon	T 4, R 2 e, Sec 11	Chocolate loam	10			1.42	4.86	84.50	.090	8.23	.115	.080	.240	.100		2.90	7.26	18.86	48.37	3.34	3.1
865		6 mi s Brandon	T 4, R 2 e, Sec 3	Silt-loam	8			1.44	4.35	85.87	.058	7.11	.125	.097	.230	.108	10.00	3.72	3.28	11.69	56.03	2.50	7.4
866		1 mi s Steen's Creek	T 4, R 2 e, Sec 3	Subsoil of 865	12			.65	1.96	91.98	.061	4.76	.085	.032	.187	.030	9.86	1.35	1.78	14.82	57.92	3.54	7.8
867		1 mi s Steen's Creek	T 4, R 2 e, Sec 3	Sandy-loam bottom	6		300	.65	3.27	91.00	.056	4.46	.125	.062	.193	.075							
868		1 mi s Steen's Creek	T 4, R 2 e, Sec 3	Subsoil of 867	12			1.00	2.92	88.47	.093	5.88	.130	.033	.197	.04	2.50	2.36	1.52	17.57	57.46	3.51	10.8
833		Dr. Bevil, Pugh, Oktibbeha Co		Surface Noxubee bottom			500	1.80	6.76	82.48	.132	7.47	.185	.079	.337	.14		3.64	8.75	11.96	50.70	5.04	10.3

Sundry Types of Soils.

Lab. No.	County.	Location of Land; Address of Owner.	Township, Range and Section.	Character of Soil.	Showing Depth in In. Sample was Taken.	Approx. Yield per Acre Unfertilized: Corn in Bushels	Approx. Yield per Acre Unfertilized: Cotton, lbs., lint.	Chemical Analysis: Moisture.	Volatile and Organic Matter.	Insoluble Matter.	Soluble Silica.	Iron & Alumnia Oxide.	Calcium Oxide	Phosphoric Acid.	Potash.	Nitrogen.	Physical Analysis: Gravel.	Sand.	Fine Sand.	Very Fine Sand.	Silt.	Fine Silt.	Clay.
869	—	3 mi. s. e. Jackson, Rankin Co.	T 5, R 1 e, Sec 22	Pearl River bottom	6		500	1.12	5.26	88.27	.10	4.77	.15	.057	.115		1.69	6.11	19.40	14.90	43.65	2.09	6.10
870	—	3 mi. s. e. Jackson, Rankin Co.	T 5, R 1 e, Sec 22	Subsoil of 869	10			1.02	2.91	91.61	.082	4.79	.10	.037	.120		4.23	7.96	17.54	15.53	39.14	2.79	8.87
269	—	J. J. Duncan, Washington Co.	Mississippi bottom	Surface					15.07	71.33		12.74	.34	.16	.55								
270	—	J. J. Duncan, Washington Co.	Mississippi bottom	Subsoil of 269					13.00	72.38		13.90	.20	.16	.77								
676	Bolivar	Chas. Scott	Mississippi bottom					2.09	3.80	84.48		6.68	.126	.17	.46								
677			Mississippi bottom					4.27	7.72	73.41	.082	11.17	.92	.192	6.87								
678			Mississippi bottom					3.53	9.16	73.42	.145	10.83	.89	.195	6.92								
679			Mississippi bottom					5.16	11.78	63.24	.065	13.35	.97	.216	.941								
700	Coahoma					12				83.90		7.31	.40	.092	.54								
701						24		2.95	3.26	81.50	.11	9.59	.41	.14	.54								
702						48		4.12	5.84	72.60	.11	13.54	.59	.134	.84								
703						72		1.22	2.70	88.08	.12	6.15	.34	.115	.36								
658	—	Near Garlandsville, Jasper, Co.	T 4, R 11 e, Sec 1	Black prairie				4.65	10.43	64.47	.104	13.28	.372	.118	.415								
659	—	Near Garlandsville, Jasper, Co.	T 4, R 11 e, Sec 1	Black prairie				6.70	10.64	61.25	.113	17.39	.245	.109	.50								

Mississippi Agricultural Experiment Station.

BULLETIN No. 66.

SOILS OF MISSISSIPPI:

PLANT FOOD AND PRODUCTIVENESS.

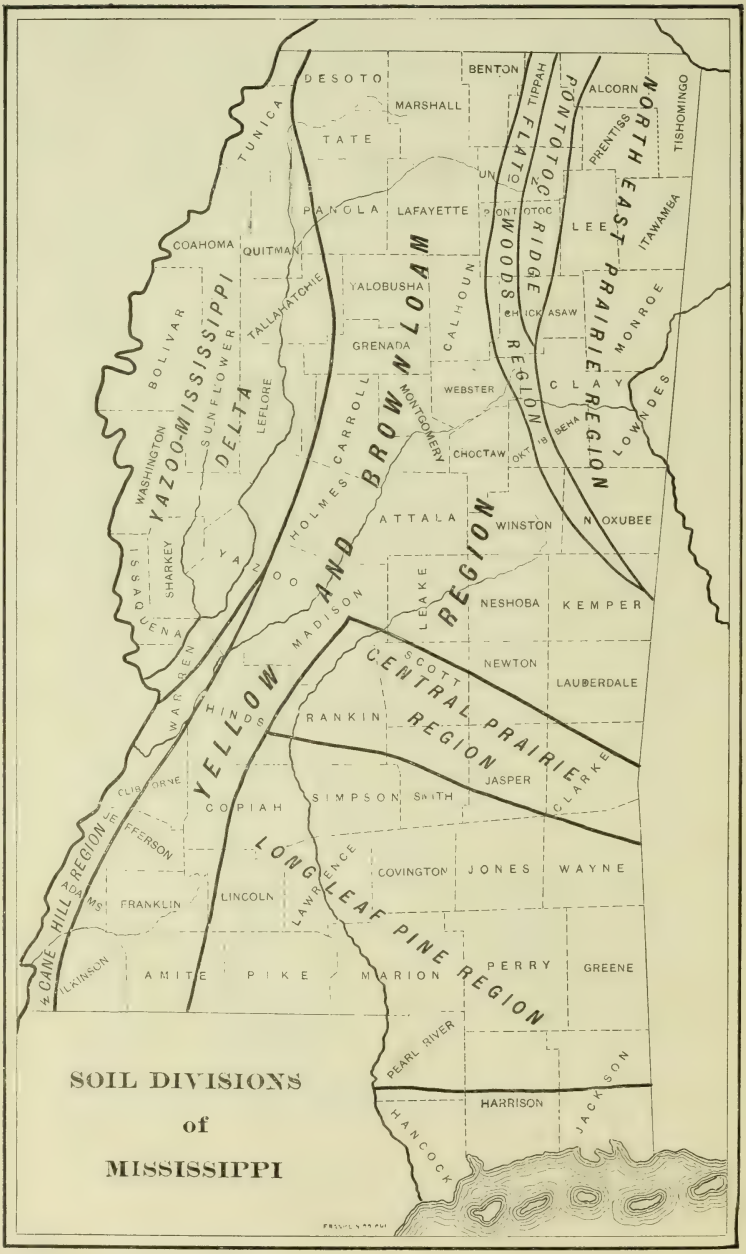
By W. L. HUTCHINSON.

Figure shows relative productiveness of surface soil and subsoil—Small stalks grown on subsoil.

AGRICULTURAL COLLEGE, MISS,

FEBRUARY, 1901.

MISSISSIPPI STATIONERY CO., YAZOO CITY.


DESOTO
MARSHALL
BENTON
TIPPAH
ALCORN
PRENTISS
TISHOMINGO
TUNICA
TATE
UNION
PONTOTOC RIDGE FLATWOODS REGION
NORTH EAST PRAIRIE REGION
PANOLA
LAFAYETTE
PONTOTOC
LEE
ITAWAMBA
COAHOMA
QUITMAN
YALOBUSHA
CALHOUN
CHICKASAW
MONROE
BOLIVAR
TALLAHATCHIE
YAZOO-MISSISSIPPI DELTA
GRENADA
WEBSTER
CLAY
LOWNDES
SUNFLOWER
LEFLORE
CARROLL
MONTGOMERY
CHOCTAW
OKTIBBEHA
WASHINGTON
HOLMES
YAZOO
BROWN LOAM REGION
ATTALA
WINSTON
NOXUBEE
ISSAQUENA
SHARKEY
MADISON
LEAKE
NESHOBA
KEMPER
SCOTT
NEWTON
LAUDERDALE
YELLOW LOAM REGION
WARREN
HINDS
RANKIN
CENTRAL PRAIRIE REGION
JASPER
CLARKE
CLAIBORNE
COPIAH
SIMPSON
SMITH
JEFFERSON
LAWRENCE
COVINGTON
JONES
WAYNE
ADAMS
FRANKLIN
LINCOLN
LONGLEAF PINE REGION
WILKINSON
AMITE
PIKE
MARION
PERRY
GREENE
PEARL RIVER
HARRISON
JACKSON
HANCOCK
SOIL DIVISIONS
of
MISSISSIPPI

SOILS OF MISSISSIPPI:

PLANT FOOD AND PRODUCTIVENESS.

Introduction.—Though good land, in proper condition, will readily rent for at least three dollars per acre, yet, we rarely find a farm, in the State, that will rent for enough to amount to more than one dollar per acre for the entire area, while most of them, perhaps, will not bring so good a revenue. There is so much unprofitable land on nearly every farm in the State that it is difficult to determine the price of first-class land, and, yet, there can be no question but that, when in good tilth, it will sell readily or rent readily at a good price. Estimating the cost of preparing land for planting at one dollar per acre, seed and planting fifty cents, hoeing two dollars, cultivation two dollars, picking at forty cents per 100 lbs., and, ginning at ten cents per 100 lbs., it costs 84 per cent. more to produce cotton on land which yields a third of a bale per acre than it does on land that yields a bale per acre. If we allow two dollars an acre rent for the poorer land, and four dollars for the better land, the cost of production is 76 per cent. greater on the poorer soil. It is also true that cotton grown on fertile soil has a superior staple and brings a better price.

It seems, and, probably is a fact, that cotton farmers have more incentive to maintain their lands in a high state of productiveness than do farmers in other sections, and, in spite of the wholesale destruction of land in the cotton belt, we believe the evidence is ample to show that cotton lands may be maintained in a high state of productiveness as easily and at as small cost as is the case with lands elsewhere. There is, doubtless, more trouble with surface washing, but this can be prevented at small cost.

Some of the unprofitable land was once the best on the farm, but the surface soil, the productive part, was allowed to wash away;

some of it, still planted and worked, but with such small yield as not to pay the expense of cultivation; some of it in valleys and bottoms, too low and wet, perhaps, for cotton, but, with a little attention given to drainage, doubtless the best grass land in the State. Still we have some farmers, who are, each year, maintaining the productiveness of all parts of their farms, and increasing the productiveness of the worn lands, but they are few and far between.

The question of productive soils is a very important one to every land owner in the State. It has, from the very beginning, been the custom of cotton farmers to neglect all those things which have to do with keeping a farm productive. They have allowed their good productive surface soil to wash away; in a section where heavy washing rains are sure to come, they have persistently run their rows down hill; they have paid little or no attention to stable manure as a means of keeping the farm productive; they have dumped their cotton seed into the streams, or allowed them to rot by the gins, or sold them to the oil mills; they have never encouraged the growth of grass on any part of the farm. Clean culture, and one crop, has been the rule. A rational system of rotation has not been practiced, nor the growing of live stock encouraged. Is it any wonder that our cultivated lands have grown poorer and the farm less productive each year?

It would be difficult to overestimate the importance, in this State, of improving soils economically and making the entire farm productive and profitable. For three years the Chemists of the Station have been at work on the soils of the State with a view of obtaining information that might be of service to farmers in their efforts to make their farms productive and to keep them so. Two bulletins have been issued as a result of this work, one dealing with the texture and water conditions, and, the other, with the chemical and physical composition of the soils in the State.

Surface and subsoils.—Subsoils usually contain as much plant food as surface soils, frequently more, but they do not contain as much organic matter, they are not as productive as surface soils, and, when first exposed at the surface, do not make desirable farming lands. The man who lets his surface soil wash away lets the productive part of his farm wash away and productiveness cannot be maintained where excessive washing is allowed. The washing of surface soils to lower levels, or, entirely off the farm, has done more than any other one thing to reduce the yields of cotton farms. Had there been no other draft on the fertility of the farm than this, it would

easily, have made the farm poorer each year. Excessive washing can be prevented, economically, and, if upland cotton farms are to be made productive and kept so, the wholesale washing, which has been allowed in former years, must be stopped. (See Fig. on title page.)

Plant food or fertility.—Evidently plants get their food mainly from the surface soil, and every crop grown and harvested lessens the amount of food left in the soil. Leaching and the destruction of humus also cause a loss of valuable substances, and, as the supply is limited, if we constantly take from it and never put back anything, exhaustion is sure to come sometime.

The soils of the State differ very much as to the amount of plant food they contain, those yielding abundant crops, without the use of fertilizers, containing relatively large amounts, while sandy soils, such as occur in the pinewoods section, usually have too little plant food for large yields.

The plant food, in crops fed to live stock, may be returned to the soils in the shape of stable manure, which will also aid in keeping up the supply of organic matter in the soil. Growing crops, to take up all soluble food, best prevent loss by leaching. Cowpeas and other leguminous or restorative crops add nitrogen to the soil, while phosphoric acid and potash may be supplied by the use of superphosphates and kainit. The amount of phosphoric acid, nitrogen, potash, and lime in the top soil, to the depth of four inches, is given, in the following table, for several of the typical soils in the State. Round numbers are used, as they can be more easily remembered, and do not lessen the value of the data given.

Table Showing Amount of Phosphoric Acid, Potash, Nitrogen and Lime Per Acre to Depth of Four Inches.

SOILS IN PRAIRIE SECTION. CHARACTER AND LOCATION OF LAND.	QUALITY OF LAND.	Phosphoric Acid, Lbs.	Potash, Lbs.	Nitrogen, Lbs.	Lime, (CaO.) Lbs.
2 mi n e Scooba, gray prairie	Poor quality	1,300	900	600	2,300
4 mi n e Scooba, prairie valley	Good quality	1,870	5,600	1,560	20,000
¼ mi s w Binnsville, postoak prairie	Fair quality	860	2,200	840	11,700
½ mi n Binnsville, black prairie	Fair quality	630	3,000	720	6,450
2 mi n e Cooksville, postoak prairie	Good quality	1,000	2,400	840	3,900
3 mi n e Cooksville, black (fox trap)	Good quality	1,000	2,600	1,000	11,800
4 mi n e Cooksville, black	Good quality	2,300	5,700	1,800	18,700
5 mi n e Cooksville, black	Good quality	1,400	5,540		17,400
1 mi w Cliftonville, ash prairie	Improved with melilotus	3,600	6,000		180,000
1 mi w Cliftonville, prairie valley	Good quality	3,800	6,100		62,800
2 mi w Cliftonville, postoak prairie	Good quality	1,260	5,400		11,400
2 mi w Deerbrook, black prairie	Fair quality	550	4,300		11,800
3 mi e Brooksville, postoak prairie	Fair quality	1,260	4,400		5,500
3 mi n Brooksville, postoak prairie	Poor quality	940	2,900		3,900
1 mi n Mayhew, postoak prairie	Fair quality	1,100	3,400	840	3,700
1 mi n Mayhew, postoak prairie	Improved with melilotus	1,450	3,250	1,600	4,300
1 mi College, black upland	Good quality	6,840	10,820		12,000
1 mi College, branch bottom	Best quality	3,600	5,500		7,500
1 mi College, yellow upland	Poor quality	1,400	2,400		2,840
College, Hort. Dept. yellow upland	Fair quality	1,680	2,100		2,200
College, Stewards, branch bottom	Good quality	1,760	2,000		3,800
College, near Bardwells, yellow upland	Fair quality	1,260	2,200		1,400
College, soil plat, yellow upland	Fair quality	1,400	2,200		2,050
1 mi e Muldrow, 2d bottom Tibbee	Best quality	1,700	3,600		22,500
1 mi e Muldrow, ash creek bottom	Good quality	1,100	3,350		67,200
½ mi e Muldrow, 2nd bottom ash creek	Good quality	1,300	2,400		4,550
½ mi e Muldrow, made valley	Best quality	1,260	2,400		2,400
2½ mi e West Point, postoak valley	Best quality	2,250	4,000	1,200	11,200
2½ mi e West Point, postoak prairie	Improved with clover	600	2,300	600	7,800

6 mi n West Point, postoak prairie	Poor quality	1,350	3,100	1,050	5,150
2 mi e Prairie, postoak prairie	Improved Melilotus	2,100	4,800	1,400	74,000
3 mi w Prairie, black prairie	Good quality	1,050	2,400	1,500	18,000
½ mi e Gibson, black prairie,	Good quality	1,800	4,400	1,700	8,150
6 mi s Okolona, black prairie bottom	Best quality	1,400	3,600	1,900	12,000
1 mi n Okolona, gray prairie	In Johnson Grass	400	2,400	1,200	7,200
2 mi n e Okolona, black prairie	"Exhausted"	600	3,100	1,600	10,000
3 mi n Okolona, gray, bottom soil	Good quality	1,650	4,800	2,250	70,000
4 mi s Shannon, yellow upland	1-5 bale per acre	600	1,600	500	1,900
Near Houlka, red pontoc ridge	Fair quality	600	2,200	700	1,300
8 mi n Houston, pontoc ridge	¼ bale per acre	700	3,100	800	1,800
¼ mi s Shannon, creek bottom, stiff	Good quality	1,600	4,100	2,000	9,600
3 mi w Shannon, yellow upland	Fair quality	2,400	2,600	1,200	39,000
3 mi w Shannon, black prairie	Fair quality	2,800	3,600	2,400	15,000
2 mi w Shannon, creek bottom	Best quality	2,400	4,800	1,900	18,000
1 mi w Shannon, light bottom	Fair quality	800	1,800		2,800
1 mi n Shannon, creek bottom	Best quality	2,200	4,800	1,600	11,000
2½ mi n Shannon, creek bottom	Best quality	1,400	3,000	1,800	5,000
2 mi n Tupelo, creek bottom,	Best quality	1,000	2,400	1,000	6,000
3 mi s Saltillo, creek bottom	Best quality	950	3,000	1,000	4,000
4 mi s Guntown, yellow upland	Forest	400	1,150	500	600
½ mi n Guntown, beeswax prairie		3,000	2,150	1,500	115,000
1 mi e Baldwin, sandy creek bottom	Good quality	700	1,550	1,300	1,900
1½ mi e Baldwin, sandy upland	Representative for section	300	1,000	600	350
4 mi s Booneville, sandy upland	Representative for section	500	1,200	720	1,400
1 mi e Baldwin, creek bottom	Good quality	1,000	2,600	1,400	6,000
5 mi n Baldwin, Beeswax	Postoak ridge	400	1,200	1,200	2,200
Near Booneville, Beeswax prairie		1,550	2,700	1,200	9,600
1 mi e Booneville, blackjack ridge	Sandy and poor	200	1,200	960	850
7 mi w Booneville, blackjack ridge	Sandy and poor	250	850	300	850
6 mi w Booneville, prairie bottom	Black, good quality	1,000	4,300	1,000	16,000
6 mi w Booneville, white upland	Fair quality	600	1,400	600	1,900
7 mi w Blackland, white soil	Sandy, poor	300	1,600	500	1,700
1 mi s Blackland, prairie bottom	Black, good quality	1,400		1,500	12,000
4 mi s e Corinth, river bottom		850	1,800	1,800	2,800
6 mi s Kossuth, gray upland	Fair quality	600	1,900	700	1,700
4 mi w Graham, gray surface	Red subsoil	450	1,200	1,200	1,500
2 mi n e New Albany, sandy upland	Fair quality	450	2,200	960	1,900
2 mi n e New Albany, sandy upland	Very fair quality	480	2,000	1,000	2,200

Table Showing Amount of Phosphoric Acid, Potash, Nitrogen and Lime Per Acre to Depth of Four Inches.

SOILS IN PRAIRIE SECTION. CHARACTER AND LOCATION OF LAND.	QUALITY OF LAND.	Phosphoric Acid, Lbs.	Potash, Lbs.	Nitrogen, Lbs.	Lime, (CaO.) Lbs.
9 mi s e New Albany, Pontotoc ridge		700	2,400	750	1,700
Near New Albany, Pontotoc ridge		300	2,200		1,400
9 mi n Pontotoc, Pontotoc ridge	Good quality	2,000	4,000	1,200	1,700
6 mi n Pontotoc, Pontotoc ridge		1,150	4,000	600	1,200
10 mi s Corinth, yellow loam	Fair quality	850	2,100	1,200	1,800
CENTRAL PRAIRIE SOILS.					
5 mi e Shubuta, prairie valley	Good quality	1,400	3,300	1,300	14,500
8 mi e Shubuta, yellow prairie	(Iron pebbles, ¼ bale)	1,200	3,600	1,400	10,000
2 mi e Shubuta, postoak soil	Poor quality	450	3,600	500	1,500
YAZOO-MISSISSIPPI DELTA SOILS.					
Graball, Tallahatchie Co., Delta soil		3,000	5,400		11,000
Rosedale, Deer creek bottom	Best quality	2,000	5,400		10,000
Rosedale, Deer creek	Buckshot	2,300	8,300		11,000
Rosedale, black sandy loam	Best quality	2,400	8,300		10,000
Rosedale, Buckshot	Best quality	2,600	11,500		11,500
Greenville, Not satisfactorily productive		2,400	9,000	1,400	7,800
Rolling Fork, Not satisfactorily productive		2,600	11,000	1,800	10,000
Rolling Fork, 68 per cent. fine sand		1,400	3,600	500	5,000
SANDY AND SANDY LOAMS, CLAY SUBSOIL.—FERTILIZER SECTION.					
3 mi s Louisville, upland	Representative	250	1,600	600	1,200
2 mi w Perkinsville, basin land	Fair quality	500	1,900	600	1,800

2 mi n Handle, basin land	Good quality	670	1,700	660	1,900
2 mi w Herbert, basin land	Good quality	900	1,700	550	800
2 mi w Herbert, basin land	Best quality	720	2,400	600	1,500
2 mi w Herbert, basin land	Poor quality	330	1,100	720	240
8 mi w DeKalb, gray sandy loam	Fair quality	240	1,600	400	840
Near Chester, sandy loam	Fair quality	450	2,250	600	1,250
½ mi Neshoba Fair, gray, red subsoil	Good quality	600	2,000	960	900
1 mi Dixon, basin land	Best quality	1,000	2,900	1,280	2,000
1 mi Dixon, basin land	Sandy	540	1,950	480	960
Cash, loam upland	Representative	600	1,800	840	1,600
3 mi e Harpersville, basin land	Best quality	1,000	3,000	1,000	2,800
3 mi e Harpersville, basin land	Good quality	500	2,400		1.200
4 mi s Brandon, loam upland	Fair quality	480	2,300	660	2,200
1 mi s Steens Creek, sandy-loam valley	Good quality	750	2,300	900	1,500
1 mi Pugh, Noxubee bottom	Best quality	950	4,000	1,680	2,200
3 mi s e Jackson, Pearl river bottom	Best quality	700	1,400		1,800
2 mi n Jackson, brown loam	Poor quality	480	2,000		2,300
2 mi s e Madison, brown loam	Good quality	480	3,100	500	2,000
1 mi s e Madison, brown loam	Rrepresentative	500	2,150	720	1,750
1 mi e Canton, brown loam	Fair quality	480	2,700		3,200
3 mi e Centerville, brown loam	Good quality	660	1,500		1,150
3 mi s Centerville, brown loam	Good quality	400	2,000		960
Crystal Springs, brown loam	Good quality	775	2,400	900	1,800
Crystal Springs, brown loam	Good quality	700	2,670	840	900
2½ mi s w Crystal Springs, brown loam	Good quality	480	2,050	900	1,700
12 mi e Crystal Springs, Pearl river 2nd bottom	Best quality	1,800	2,400	2,300	2,700
14 mi s e Crystal Springs, Pearl river bottom	Best quality	800	3,100	720	1,440
13 mi e Crystal Springs, sandy loam	Good quality	720	3,000	840	1,200
13 mi s e Crystal Springs, sandy loam	Fair quality	480	2,400	840	1,860
Near Mico, sandy loam	Representative	550	1,570		2,400
Near Mico, sandy	Representative	400	1,900		1,800
Near Perkinston, (big level)	Representative	400	1,100		2,160
4 mi s Booneville, sandy upland	Representative for e of M & O R R	500	1,240	720	1,400
1 mi e Baldwyn, sandy upland	Representative for e of M & O R R	300	1,000	600	360
1 mi e Booneville, sandy	Blackjack ridge	200	1,000	300	860
7 mi n Blackland, sandy	Gray-white soil	330	1,000	700	2,460
6 mi s Blackland, sandy	Gray-white soil	600	1,450	600	1,900
1 mi e Liberty, silt-loam (w pinewoods)	Good quality	475	1,150		3,000
4 mi w McComb, yellow silt-loam	Poor quality	350	950		900

Table Showing Amount of Phosphoric Acid, Potash Nitrogen and Lime Per Acre to Depth of Four Inches.

SANDY AND SANDY-LOAMS, CLAY SUBSOIL.	FERTILIZER SECTION.				
CHARACTER AND LOCATION OF LAND.	QUALITY OF LAND.	PHOSPHORIC ACID, LBS.	POTASH, LBS.	NITROGEN, LBS.	LIME, (CAO.) LBS.
Ocean Springs, hummock	Representative	350	600		1,750
Ocean Springs, sandy soil		200	900		2,700
Welch, Covington Co., sandy loam	Good quality	2,000	1,100		3,600
1 mi e Liberty, sandy-silt pinewoods	Good quality	500	1,150		3,000
4 mi w McComb, sandy-silt pinewoods	Poor quality	350	950		900

Discussion of results.—The results show that the prairie soils, and, also, most of the soils in the northeastern prairie region, contain relatively large amounts of the ingredients reported in the tables, which are the important ones. The amount of phosphoric acid in the sandy, sandy-loam, basin, and brown silt-loam soils is relatively small, and it is on these lands that commercial fertilizers are constantly used under all crops. These lands should also have the benefit of stable manure and cowpeas with superphosphates under crops following the cowpeas.

Soils containing 1,000 lbs., or over, of phosphoric acid per acre, in the upper four inches of soil, have enough of this ingredient for large crops, i. e. they may produce a bale of cotton per acre, or fifty bushels of corn without the use of phosphates. As the amount of this ingredient, in the surface soil, falls materially below 1,000 lbs. per acre, the demand for phosphates is apparent in proportion to the deficiency, provided all other essential conditions for large yields are present.

The supply of potash seems to be ample everywhere in the State and we have no evidence that any of our soils require the use of fertilizers containing potash to increase the yields. The results do not indicate the minimum amount of potash in the soil that is adequate for good crops.

Nitrogenous fertilizers increase the yields of most of the soils in the State and where nitrogen is added by growing cowpeas, velvet beans, vetch, and melilotus, which also add organic matter to a soil and improve its texture, results of the most satisfactory kind are obtained.

Some of our soil work also indicates that, where the amount of phosphoric acid in a soil is abnormally high, the cotton plant will use several times as much of this ingredient as it needs for normal development. This is probably true of other substances as well. In interpreting soil analyses it is well to remember this fact. In explaining e. g. why two soils give the same yields, though one has two or three times as much plant food as the other, it is not necessary, as has been done, to assume that the crops on the two soils have taken up the same amounts of food, by the crop on the poorer soil rooting and feeding deeper than did the crop on the soil richer in plant food. Plant food may not be the controlling factor in the yield produced on either soil. All of our results indicate that soils rich in plant food will produce crops in proportion, if all of the controlling factors in plant growth are adequate and favorable to maximum yields.

Lime, in large amounts, undoubtedly influences the texture of a soil; it may also have to do with the solubility of the plant food in a soil, but, with good texture, soils will produce well even though the amount of lime present is small. The brown loam soils do not contain much lime, and, yet, in proportion to the amount of plant food present, they are probably the most productive lands we have. The texture of these soils is good.

Soils rarely present the best conditions for plant growth. Some farmers are able to use such good judgment as to improve the faulty conditions, while others make bad matters worse. This is often the only reason why two soils having the same composition, vary in productiveness.

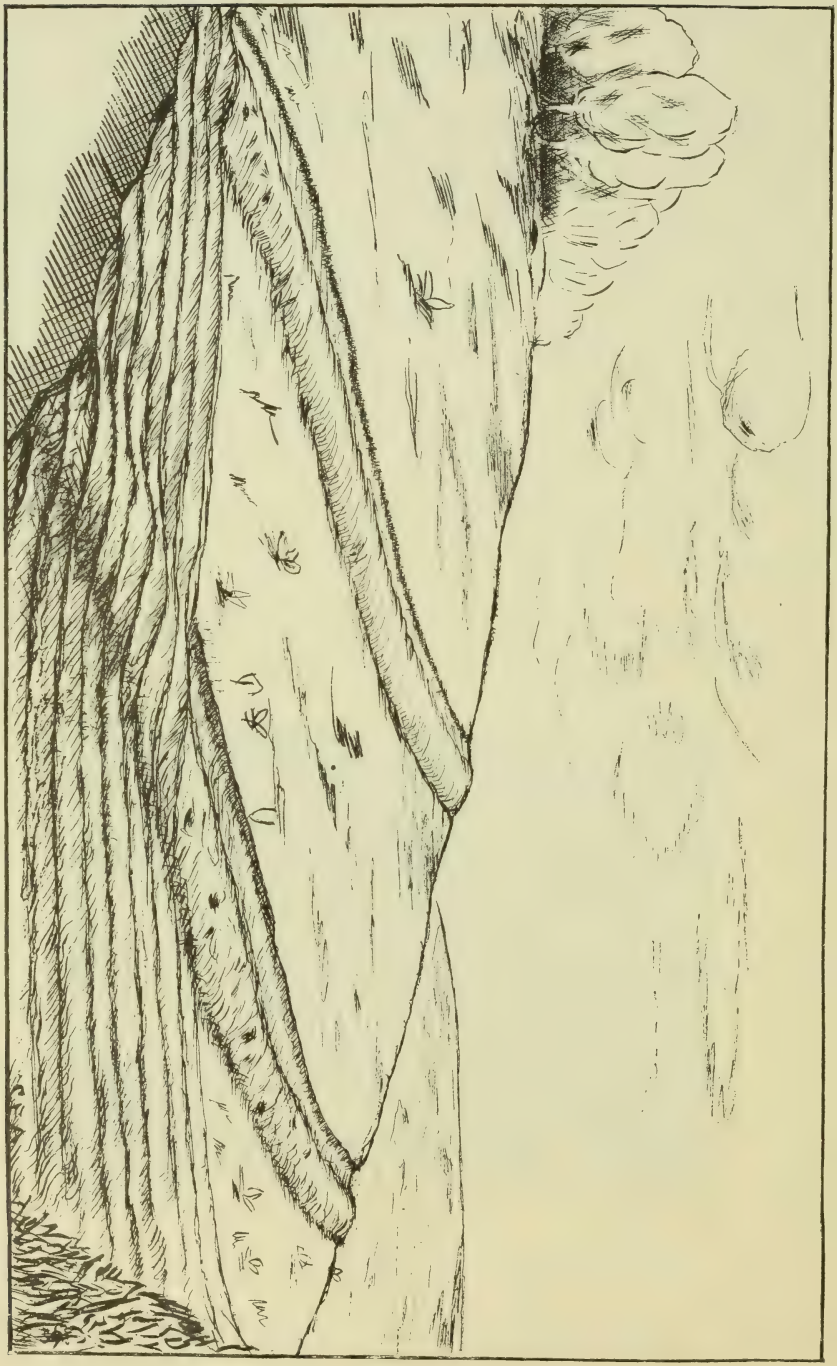
WASHED SOILS.

To prevent washing.—Three methods have been developed for preventing rolling upland cotton soils from washing. One is to have a system of embankments without any fall or grade, and, also, to have all the rows in the field as nearly on a level as possible. This system is extensively in use by farmers in the eastern cotton states. A second system gives each embankment a little fall and each row a little fall. In this system each row is expected to control all the water that falls on it, and each embankment to control all the water that comes to it. The rows are to carry all surplus water from one embankment to the one next lower on the slope. A third system partially terraces the slope. All three systems have merit and give entire satisfaction on certain lands.

Graded embankments.—The graded system of rows and embankments is based on the idea that, during our heaviest and

View of graded embankment showing shallow depression 6 feet wide, and guide row crossing from plat above.

quickest rains, most soils will not absorb the water as fast as it falls, and, hence, there will be a surplus to move over the surface and that



CUT SHOWING GRADED EMBANKMENTS WITH ROWS CROSSING.

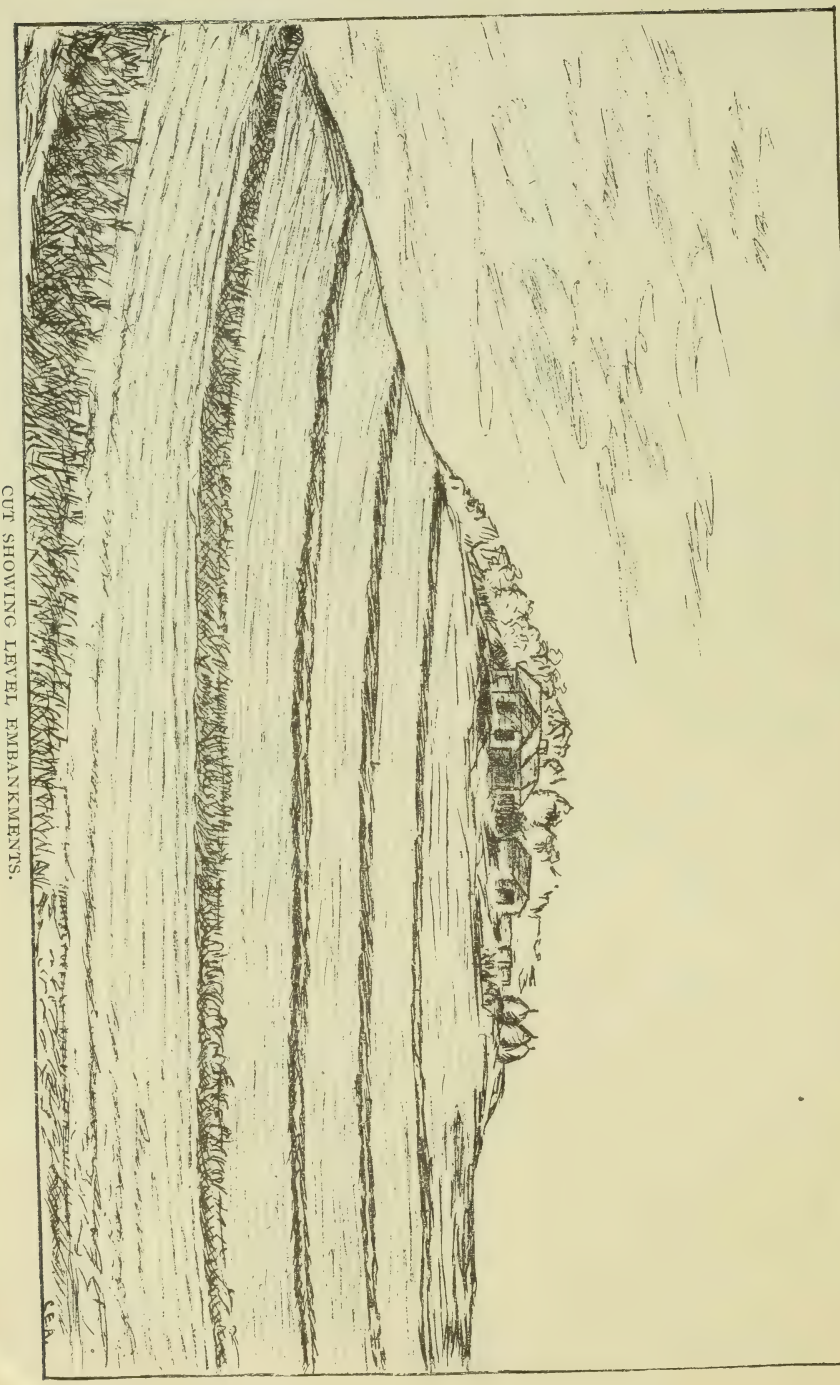
it must be made to move slowly or else it will wash. This idea is a correct one.

The embankments are made approximately six feet wide with a depression or shallow ditch, on the upper side, six feet wide. The embankment should be made high enough to control all water that comes to it. Fifteen to eighteen inches high will usually be sufficient. The fall given should be enough to enable the embankment to carry off all surplus water without giving it velocity enough to wash or carry much soil. We give ours a fall of six to eight inches in a hundred feet. The rows are given the same fall as the embankments, but not in the same direction; the fall of the embankments is toward the head of the ditches or channels into which they empty, and the fall of the rows is toward the head of the embankment to which they carry water.

In this system no land is lost or left uncultivated, the embankment, as well as the depressions or shallow ditches, being planted and cultivated the same as other parts of the field.

Level embankments.—Where the embankments are run on a level they are made about four feet wide at the base and fifteen to eighteen inches high. They occupy about the same amount of land as a row and are not cultivated. The rows are run parallel to the embankments, and much care is taken to have all the rows in the field on a level. This system aims at holding all water practically where it falls until it soaks into the soil. Where this can be done, of course the land will not be washed. On gentle slopes, where the soils are porous and water sinks rapidly, washing can be prevented by this method. The perpendicular fall between embankments may be six to eight feet.

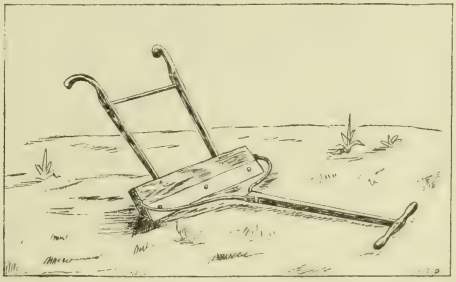
So-called terraces.—In the terrace system, lines of level are run the same as for level embankments, and the rows are also run on a level but no embankments are made. The terrace lines, however, are never broken with the plow. Reversible plows are always used for breaking the land so that the soil is always turned down hill. This tends to level the plats between two lines of level with a perpendicular rise, at each line of level. Really about the only difference in this system and the level-embankment system is the use of the reversible turning plow, in breaking and turning all the furrows down hill, which results in the accumulation of soil on the upper side of the unbroken terrace line, which acts as a low embankment. At every breaking each terrace line is built up a little. The fall between terraces may be three or four feet.



CUT SHOWING LEVEL EMBANKMENTS.

Making the embankments.—For getting the levels or grades any of the cheap farm levels may be used or a good one can be made at home by the use of three pieces, 2x2, and a small pocket level, or, else, a carpenter's level.

MAKING GRADED EMBANKMENT WITH ROAD MACHINE.



SCRAPER FOR MAKING EMBANKMENTS.

A road machine is by far the best implement for making the embankments, but it is not necessary. They may be made very easily and rapidly with plows and shovels, and a plank board for raking up the loose dirt.

Combining the systems.—Any two of these systems can be combined on the same plat of ground, or, all three may be used. Where it is especially difficult to keep a slope from washing, or, numerous washes are already formed, it is sometimes desirable to make the guide rows, of the graded system, into permanent embankments, precisely similar to those used in the level system, and then if the use of the reversible turning plow, between the guide embankments, will help still further, it may be used without any trouble.

Reclaiming washed lands.—Most cotton farms have larger or smaller areas that were once in cultivation, but the surface soil was allowed to wash away and gullies to form, and the land has been out to grow up in pines, briers, etc., so that a new surface soil may be made. In fifteen or twenty years the pines, briers and lespedeza make another soil but they will not, unaided, smooth the surface. By cutting some of the pines and putting them in the washes and gullies, these will begin to fill, and briers and other stuff will grow in them, and, finally, by plowing and a few embankments, if necessary, the surface can be made smooth by the time the soil is ready for cultivation again. It is better to have the filling of the gullies and washes go on at the same time that the new soil is being made, than to wait later. The location of these abandoned fields is often such as to lend value to them and we have seen these gullied areas made into the most profitable and desirable farming lands.

STABLE MANURE.

One of the valuable products on a farm is the manure from the live stock, and cotton farmers must learn to so regard it if they ever maintain the productiveness of the entire farm. The plant food in all crops and products fed to live stock may be returned to the soil in the shape of manure and the money value, of the plant food that may be so returned, is too great to be always neglected and allowed to go to waste. In addition to the plant food returned, stable manure helps to keep up the supply of organic matter in the soil.

Cotton farmers should doubtless excel all others in the care given manure from live stock, because their soils stand peculiarly in need of it, and, because of the further fact, that animals fed on cotton products produce manure of the highest value. The manure from an animal fed one ton of cottonseed meal is worth $19.00, where a ton of seed is fed, it is worth $9.00. For every million bales of cotton there are half a million tons of seed, which, if fed, would produce manure worth four and a half-million dollars. Feed the seed, or, the meal and hulls, from a cotton crop of ten million bales, and the manure from the animals is worth forty-five millions of dollars. If the cotton seed annually produced in Mississippi was fed, the manure produced would be worth five times as much as is paid for commercial fertilizers.

Parking or penning cattle.—It is not an easy matter to prevent the manure produced on a farm from going to waste, and, yet, any farmer, who realizes that it is one of the valuable products on his farm, can so manage as to derive benefit from it. The urine is the most difficult to save, and yet it is the most valuable part of animal excretions.

The surest way to prevent loss in manure is to get it on the land where you want it and mix it with the soil, and this the cotton farmer may easily do by parking or penning his cattle on the land to be manured. In this section it is neither necessary nor desirable to confine cattle in stalls for any great length of time, even during the winter months, and parking may be practiced as the principal method of saving manure on the cotton farm. It is simple, inexpensive, and, is not troublesome and may easily be made to increase the productiveness of the farm.

There is one little difficulty to be watched and guarded against

in parking cattle, and that is injury to the texture of the soil, by tramping, during very wet weather. In all of the fertilizer section of the State this is not a serious difficulty to be overcome. There are large areas, in this section, where tramping improves the texture of the soil; and, cattle need not be confined on small areas when the ground is very wet; or they may be kept up and given all the hay and other roughage they will eat. But in the prairie sections, or, wherever the texture of the soil is seriously injured by tramping in wet weather, parking should be practiced with more care and discretion.

Stall manure.—Bedding, sufficient to absorb the urine and keep the animals clean and comfortable, is necessary to success in saving the manure of animals confined in stalls. Farmers elsewhere find it profitable to save all of the manure in this way, and it would seem that cotton farmers would find it profitable to provide bedding for all such animals as are confined in stalls.

To be profitable, stall manure must be handled so as to prevent loss as much as possible. It should be kept cool, moist and compact; it should never be exposed to rain nor piled in loose heaps where the air may circulate freely through it. Where the bedding is properly regulated, manure keeps well so long as it remains in the stalls and this suggests how it should be kept, after being removed from the stalls, until it is put on the land.

Ten tons of good stall manure per acre is a very good application for one year, but twenty and even forty tons may be used. Use small quantities often, is a very good rule to follow, both in parking and in applying stall manure.

RESTORATIVE CROPS.

Organic matter.—Undoubtedly organic matter is one of the most important things in a soil and has much to do with its productiveness. It has a marked influence on the texture of soils, rendering them mellow and friable; it also has to do with the plant food and water available for crops. Cotton culture rapidly destroys the organic matter in soils and it is a good practice to keep up the supply by the frequent addition of small amounts, which may be done by the use of stable manure and by growiug restorative crops in a proper rotation.

Legumes.—Cowpeas, vetch, velvet beans, clover, alfalfa, melilotus and lespedeza all have the power, through certain bacteria that attach themselves to the roots of these plants, of using atmospheric nitrogen in their growth; they are all rich in nitrogen and such crops may be used for adding nitrogen to soils at less cost, perhaps, than in any other way. One crop of cowpeas, velvet beans, vetch, or melilotus may add to the soil as much nitrogen as is contained in a ton of cottonseed meal. Besides adding nitrogen, these crops deepen soils and improve their texture.

Cowpeas.—Though cotton farmers have several restorative crops that they may use as opportunity serves, none of the others can be used to so good advantage generally, as cowpeas; they grow well on every character of soil in the State and improve every piece of land on which they grow, though they must not be regarded as a cure for all the ills soils are heir to. If a soil is deficient in phosphoric acid growing cowpeas will not remedy the deficincy.

While the fallen leaves and stubble do not improve a soil as much as the entire crop, yet, their effect, in increasing the yield of succeeding crops, is so nearly equal to that of the whole crop, that it pays better to cut the vines for hay than to use them as a fertilizer.

Wherever soils are deficient in phosphoric acid, which is the case in all of the section using commercial fertilizers, superphosphates must be used in connection with cowpeas or else the latter will be of small benefit in many cases.

Melilotus.—For lime lands, such as are found in the prairie sections, melilotus is just as good as cowpeas and may often be used to better advantage as it will make a good growth even on the bare

lime rock. Melilotus should occupy the land at least two years, but the field may be used as a pasture or the melilotus cut for hay when about eighteen inches high.

Vetch.—The best restorative crop, for use during the winter and spring months, is hairy vetch. It collects fully as much nitrogen as cowpeas and improves the land just as much. As it ripens by the first of June the land may be used for summer crops. Burr clover makes its growth during the same period as vetch and where it does well is just as good for improving soils.

Lespedeza.—On badly worn soils in the cotton belt lespedeza is easily the best leguminous crop to occupy the land; the fact that it does so without effort on the part of the farmer does not lessen its value for reclaiming worn lands. It seems better adapted to the brown loam soils of this State than on any other on which we have seen it grow, though, like the cowpea, it grows well on all classes of soils.

Velvet beans.—Another leguminous crop that cotton farmers may use for improving their soils is the velvet bean. By planting early in the spring it will cover the ground with a dense shade all summer, and grow until frost. It gets large amounts of nitrogen from the air, and for improving soils is fully the equal of cowpeas or any of the other crops mentioned.

Cowpeas and superphosphates.—The weakest link in a chain determines its strength and where soils are deficient in phosphoric acid cowpeas or other leguminous crops will add nitrogen to the soil, but, unless phosphates are also used, the yield of succeeding crops may not be increased materially. To get the full benefit of a crop of cowpeas in all of the section where fertilizers are used as well as all of the brown loam, fertilize succeeding crops with superphosphates.

FERTILIZERS.

To keep up the productiveness of their lands, cotton farmers have depended too much on commercial fertilizers. The use of superphosphates will have to continue, except where stall manure is used or the land is enriched by parking cattle, but they could so manage as to dispense with the purchase of millions of dollars worth of nitrogen and potash. When they do the best that circumstances permit, they will dispense with all unnecessary expenditures for fertilizers.

So far as plant food has to do with the yield of crops, two substances only need receive the constant attention of the cotton farmer. One is nitrogen, the other phosphoric acid. Leguminous crops may be used for supplying nitrogen, and superphosphate, for the phosphoric acid.

Study the farm.—To be able to use good judgment in dealing with the problems on a farm there are many things one should know about it. Good farming is not a matter of thumb rule but of good judgment based on correct principles, and, information as to matters of fact. When crops do not grow well because the supply of water is irregular, insufficient or excessive it is a waste of money to fertilize. If the soil will only furnish enough phosphoric acid for a small crop no amount of nitrogen or other plant food, nor the best water conditions, will do any good until the phosphoric acid is added. Several things may determine the yield of a crop, and when trying to make a soil more productive so proceed as to make all essential factors favorable to large yields. Every farmer should know every part of his farm so that he could correctly answer the following questions; viz.:

Is the yield of this field determined by plant food or water?

Where plant food is needed what substances are deficient, nitrogen or phosphoric acid, or both?

Are the water conditions favorable and the supply ample for large yields?

Does this field need both fertilization and improvement in water conditions?

Mississippi Agricultural Experiment Station.

BULLETIN No. 67.

GOOD DIRT ROADS FOR MISSISSIPPI.

— BY —

J. W. FOX and W. L. HUTCHINSON.

Fig. I. Showing finished section of dirt road. See Fig. VI. for same section of road before working.

AGRICULTURAL COLLEGE, MISS.,

APRIL, 1901.

MISSISSIPPI STATIONERY CO., YAZOO CITY.

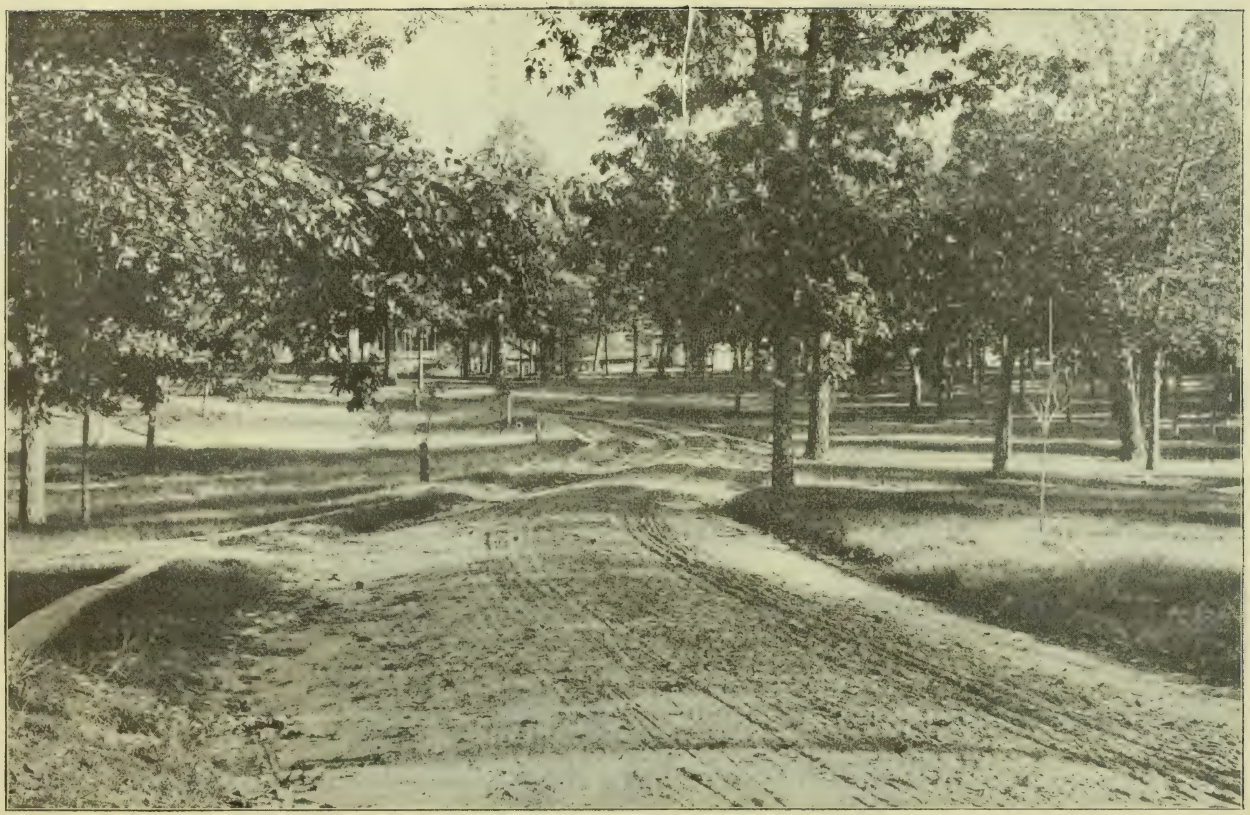


FIG. II. SECTION OF DIRT ROAD ON MISSISSIPPI A. & M. COLLEGE CAMPUS.

GOOD DIRT ROADS FOR MISSISSIPPI.

Introduction.—The rapid industrial development going on in the State, and the building of new railroads, to meet the demands of increasing business and traffic, are attracting some attention to the dirt roads and the necessity for improving them. Provided they will adopt the best business methods in making them, the people of the State may have good dirt roads in a comparatively short time. There probably is no good reason why supervisors should deal with this very important matter with less business ability and less system than they do other public matters that come before them.

The roads may be first properly shaped and drained and then graded; but such improvement should be made with the expectation that they will finally be surfaced with gravel or other material. To shape, drain and grade our dirt roads will improve them materially, and the cost will not be burdensome. Surfacing roads is expensive, and, in consequence, it takes years for any people to accomplish it.

Good roads can not be made nor maintained by doing a little work on them once or twice a year. This is not a businesslike way to deal with the matter, and no further comment is necessary on the present expensive and wasteful method of warning out hands for road duty at the very time, perhaps, when the least efficient work can be done. To have good roads it must be made the regular business of some one to make and maintain them, and this may be done by contract—specifying what is required.

Some of our roads should be located differently, so as to lessen the cost of grading, as roads should either go around steep hills or through them. Locate the roads properly and grading them will be a simple and easy matter. The people of this State should appreciate the comparative ease with which they can have good dirt roads; for surely our difficulties are not nearly so great as those that have to be overcome in many sections.

Present system defective.—Building and maintaining roads by statute labor, or what is commonly known as "warning out the hands," has always failed. It was never intended to be more than a makeshift for a plan of road making; having some merits, perhaps, for pioneer settlers. In every instance where a state, county, or district has built good roads, or made any progress toward permanent road improvement, the statute labor plan has been abandoned and a more efficient and businesslike method adopted.

The defects of the system are evident. The three most glaring are: (1) The labor tax is not honestly paid, being either avoided or slighted in various ways by the majority of the hands. A few do honest work and take an interest in it; but, as a general rule, the object seems to be either to get over the section of road in any style, and thus get a disagreeable job done, or else make the few days road work a time for recreation, in which to laugh and joke with their neighbors. As a result, the amount of labor tax collected and expended on the road is only a very small part of that assessed to it. (2) The labor that is given to the roads is not intelligently directed. There are about as many plans of working the roads as there are overseers; and, as a rule, all of these plans are more or less defective, resulting in a partial waste of such labor as is honestly applied. (3) The time and character of work is made to suit the convenience of the hands rather than the needs of the road. The laborers bring such tools as they happen to have regardless of their adaptability to road work. The teams are usually too small and are not trained for such work. The rule is to work the roads once a year after crops are laid by; but our heavy spring rains damage roads more or less, and such damage should be repaired promptly. This labor-tax plan leaves the roads at the end of the year about in the same condition they were in at the beginning, and, if continued, at the expiration of twenty or more years we will still have just such roads as we now have. This plan has been tried so long and so extensively that even the wayfaring man need not err in what to expect from it.

Roads by contract.—To have any kind of work properly done it must be put in charge of a competent person who is to be held solely responsible for its proper performance and completion. Supervisors recognize this fact in dealing with all the county work except the building and maintaining of the public roads. If the county needs a new court house it is built by contract, according to certain specifications. The contractor is required to give bond, and the county gets what it pays for. The same plan is followed in

building the bridges of the county, as well as certain parts of the roads that are intolerably bad. In this way, frequently, the worst sections of road in the county become the best. We probably will not have any permanent road improvement until we use the same business methods for making and maintaining our roads that we use in other cases where we want things done properly and at a minimum cost.

By referring to the reports from the states that have good roads, it appears that in every instance these roads have been made by contract. The matter of road improvement is entirely in the hands of the county board of supervisors, who, if they will, can change from the labor-tax system to the contract system.

Road laws.—Only such sections of road laws as relate to the working of public roads by contract will be cited. Section 3929, Annotated Code of 1892, is as follows: "The board of supervisors may determine to work the public roads, or some part thereof, by contract, and may thereafter so work the same, letting the contracts in such cases as other contracts are let by the board of supervisors, each road or division under a separate contract. * * * " Sections 3930 and 3931 provide for the raising of the necessary funds to put in operation the above section. In effect, they provide that if a public road is to be worked and kept up by contract the road hands shall work under the contractor, not to exceed five days in any one year, or pay to him $2.50 commutation tax; unless under a general order of the board of supervisors, who may require all road hands to work under the contractor any number of days not to exceed ten in any one year, or pay a commutation tax in proportion not to exceed $5.00. Section 3931 provides that the board of supervisors may levy an additional tax, not to exceed one mill on the dollar, upon all the taxable property in the county, to be used as a separate road fund. The taxes so collected on property within a municipality, the streets of which are worked by municipal authority, shall be equally divided between the county road fund and the city street fund.

Section 3932, Code of 1892, provides for the working of the county convicts on the public roads.

Several counties in the State have taken advantage of the above road laws to abolish the old plan of working roads by labor tax. Madison county may be cited as one that has used the contract system of working roads with successful results, the roads made by contract being greatly improved. Rather than work the roads, the road hands prefer to pay the commutation tax.

The road law, approved March 12th 1900, is very similar to the ones cited above. It embraces the same general plan, but is more complete and explicit, and provides for a uniform system throughout each county that adopts it. The law is as follows ; viz.:

CHAPTER 119.

AN ACT to provide for the working of public roads by contract.

SECTION 1. Be it enacted by the Legislature of the State of Mississippi, that the board of supervisors of the various counties of the State of Mississippi, may, at the regular April term of their meeting, or any other regular meeting, after the passage of this act, meet and classify the public roads in their respective counties as roads of the first class and roads of the second class, which are to be divided into convenient links and are to be worked by contract, as hereinafter provided for.

SEC. 2. The board of supervisors of each county is hereby authorized and empowered, if they consider it necessary, to the better working of the roads, and the general interest of the county, to employ a competent person to serve as road and bridge commissioner, whose compensation shall not exceed $5.00 per day, for each day actually put in, in the active discharge of his duties as defined by the board of supervisors in each county.

SEC. 3. The supervisors of each district in each county is to have and is required to exercise general supervision over the public highways of his district, for which service he is to have a salary of $20.00 per annum, if a road commissioner is employed during the year ; if no road commissioner is employed during the year, he shall receive for said extra service a total sum of $50.00 per annum.

SEC. 4. The members of the board of supervisors, together with a road commissioner, if there be one, as they may agree, shall inspect each section of the road as sub-divided, together with all bridges in said section, and carefully note the character and amount of work needed on same, and all else necessary to make same a good and acceptable highway, and then prepare detailed plans and specifications for the working of same by contract filed for record with the clerk of the board of supervisors for the inspection of prospective bidders, prior to the first public letting under the terms thereof at a regular meeting to be named, and if the inspection is not made by all members of the board, the board may alter the plans and specifications submitted.

SEC. 5. The letting of the contract or contracts for the working and keeping in condition in its entirety of the public roads or any section thereof shall be done as in cases of letting other public contracts, as is especially provided for in sections 340 and 341 of the Annotated Code of 1892, except that the board shall have the right

to reject any and all bids, and said contracts or contract shall be let for a term of not less than two nor more than four years.

SEC. 6. There shall be required annually in each county eight days special work service on the public roads under the contractor, but any person in lieu of said special work service may pay a commutation tax for road purposes of $3.00, and said special work service on the public roads or commutation tax for road purposes in lieu thereof shall be imposed on all male persons over the age of eighteen years and under the age of fifty years, who are not blind, nor deaf, nor dumb, nor otherwise disabled by disease or loss of limb, and who are not ministers in charge of churches, rabbis, nor students in actual attendance in some school or college. In addition to the commutation tax, there shall be an advalorem tax on all taxable property in the county not to exceed one mill on the dollar, in any one year, all of which tax is to be collected as other taxes, and paid over to the county treasurer, who shall keep all such taxes as a separate road fund, to be used exclusively as such in compliance with the terms hereof, and only upon the warrant of the board of supervisors. All of the commutation tax shall be expended in the district or incorporated village, town or city, from which the same was collected, and such commutation tax for road purposes paid by the residents of such municipality shall be turned over to the treasurer of such municipality and be expended by the proper authorities thereof for that purpose, but the advalorem tax shall be treated as a general road fund for use anywhere in the county, except the taxes so collected on property within the municipality, the streets of which are worked at the expense of the municipal treasury, which shall be equally divided between the county road fund and the municipal street fund.

SEC. 7. Any person, in lieu of the commutation tax of $3.00 shall have the right to perform eight days work under the contractor, for which the board shall receive allowance of $3.00 on contract, and make provisions therefor in letting of contract, on the nearest unworked road contiguous to his residence provided said work is done prior to September 1st, of each year, at which time each contractor shall report the names of those that have worked out their time under him, to the board of supervisors, who in turn shall make a report of same to the sheriff and tax collector, who shall then regularly proceed to the collection of all delinquent road tax; and any person who fails to perform the required amount of work or to pay said tax shall be guilty of a misdemeanor, and punished by the courts as other misdemeanors. The provisions of this act relating to commutation tax shall not apply to municipalities which work the streets at the expense of the municipal treasury.

SEC. 8. The board of supervisors may require the contractor of any road to take and work the convicts sentenced to the county jail or committed to same to pay fine and cost imposed upon them, upon such terms and conditions as the said board and contractor may agree upon.

SEC. 9. On the first Monday of January, April, July and October of each year, each supervisor shall make a true and complete report to the board of supervisors of the needs and conditions of the public highways in his district, together with such recommendations as he may deem necessary, which report shall be spread upon the minutes of that particular meeting.

SEC. 10. The circuit judge shall on each term of the court especially charge the grand jury to inquire into the condition of the roads of any county, and any contractor or supervisor who neglects his duty shall be guilty of a misdemeanor and be liable to indictment, and upon conviction, shall be fined not more than $100.00.

SEC. 11. The provisions of this act shall not apply to any county in the State, except by an order of the board of supervisors to that effect, same to be duly entered upon the minutes of said board.

SEC. 12. The county assessor shall provide lists upon which he shall address all persons in his county subject to the commutation tax for road purposes, which list shall be copied upon the personal assessment roll of the county, which roll shall be so ruled as to provide for such list and the assessor shall be allowed for such service one cent for each commutation tax assessment made under this act.

SEC. 13. This act shall not apply to any county that is already working its roads under special contract unless the board of supervisors of said county elects to come under the provisions of this act.

SEC. 14. That this act take effect and be in full force from and after its passage.

Approved march 12, 1900.

Funds.—By reference to the above laws it will be seen that the money necessary to pay contractors may be derived from the following sources; viz.:

(1) Each road hand shall pay a commutation tax of $3.00 or work under the contractor eight days, the tax on labor to be expended in the district in which it is collected.

(2) A tax, not to exceed one mill on the dollar, to constitute a separate road fund for use anywhere in the county except that the taxes so collected on the property in a municipality, the streets of which are worked at the expense of the municipal treasury, which shall be equally divided between the county road fund and the municipal street fund.

(3) The county convicts may be worked on the public roads on such terms and conditions as may be agreed upon by the contractor and the board.

(4) The teams and tools of persons not liable to road duty, as

provided in Section 3910, Code of 1892, are also liable under the act of 1900, according to an opinion given by the Attorney-General to the board of supervisors of Oktibbeha Co. The Attorney-General has also ruled that the act of March 12th, 1900, providing for the working of public roads by contract, does not limit the funds for roads and bridges to the one mill advalorem tax mentioned in the act. The funds raised by the one mill tax may be supplemented by any other funds which heretofore might have been properly appropriated to such purposes. If the one mill tax is not sufficient to keep up both roads and bridges, it may be used entirely on the roads and the bridges kept up as hevetofore.

To illustrate, let us suppose the conditions in a certain county to be as follows:

Number of miles of road in the county,	400
Number of road hands,	3,000
Total taxable property,	$2,500,000
One town or city, taxable property,	$500,000

FUNDS FOR ROAD PURPOSES:

3,000 road hands, $3.00 commutation tax each,	$9,000
$2,500,000 at one mill on the dollar,	2,500
Total,	$11,500
Less ½ mill on $500,000, retained in city	250
Net amount for 400 miles of road each year,	$11,250
Average amount per mile each year,	$28.12½

Remembering that the county convicts may be worked on the public roads, and that the usual amount of county funds, in addition to the above, may be expended in building bridges, purchasing road machinery, etc., and that the teams and tools of persons not liable to road duty may be used on the roads, it is easy to get a definite idea of the funds available for road purposes under the law of 1900.

In making the above estimate we had no way of determining the number of road hands nor the number of miles of public roads in the counties. The figures for these two items are taken from Clay county. According to a recently published statement of Auditor Cole, giving the taxable property in the several counties, it appears that the average for all of the counties is $2,876,879 which is more than the amount used in the above illustrative statement.

GOOD EARTH ROADS.

Drainage.—It is desirable to have roads with a hard, smooth surface, and as wet soil is soft, thorough drainage is an essential for

good roads. In this State good surface drainage is all that will usually be needed, and this may be accomplished by making good side ditches and giving the roads the proper shape. The center of a road should be enough higher than the sides to make it act like a roof,

Fig. III. Cross section of a good form of earth road.

so that all water that falls on it will quickly run into the side ditches or gutters. A fall of one inch to the foot from the center to the sides will usually be sufficient, but on steep grades the slope should be

Fig IV. Section of trial road before working. See Fig. V.

enough to make the water run toward the sides instead of down the road. The diagram shows the proper shape for the surface.

Cost per mile.—Where road machines are used, the average cost for properly shaping a road and making good side ditches should not exceed $25.00 per mile. The judicious expenditure of $15.00 per mile will give very much better roads than we now have. To get an idea of the cost of making and maintaining dirt roads we selected a mile of what appeared to be an average road. There were five small bridges on the piece of road selected, showing that the road was somewhat hilly. The road machine was run for ten hours. Four men and six mules with plow and dump scrapers worked for half a day filling on each side of the bridges and completing such ditches as

Fig. v. Finished section of trial road, same as Fig. IV.

could not be finished with the road machine. The above represents the normal work on the road, but in addition the same force worked one whole day filling at one of the bridges. This last day's work should be classed under the head of grading.

Eight mules were worked to the road machine. Two men were used to drive the team and one to operate the blade. One driver should be able to handle a trained team. To operate a road machine should not cost more than $5.00 a day or $1,200 to $1,500 a year. We tried to have our trial represent average conditions; yet, for shaping the road and making good side ditches the cost was only about $10.00 per mile. We will probably spend, during the year,

$5.00 more keeping this road in good repair and the surface smooth. We have traveled fifteen hundred miles over the dirt roads in different parts of the State, and we know that there are hundreds of miles of these roads that can be worked entirely with a road machine at a cost not exceeding eight to ten dollars per mile.

Road machinery.—For making and maintaining dirt roads the only machinery needed is a road machine, or road grader. As the sickle compares with the reaper for harvesting grain, or as the hand loom compares with a modern factory for making cloth, so, for road work, does a one horse plow and a hoe compare with a road machine. It is a significant fact that most of the dirt roads in the

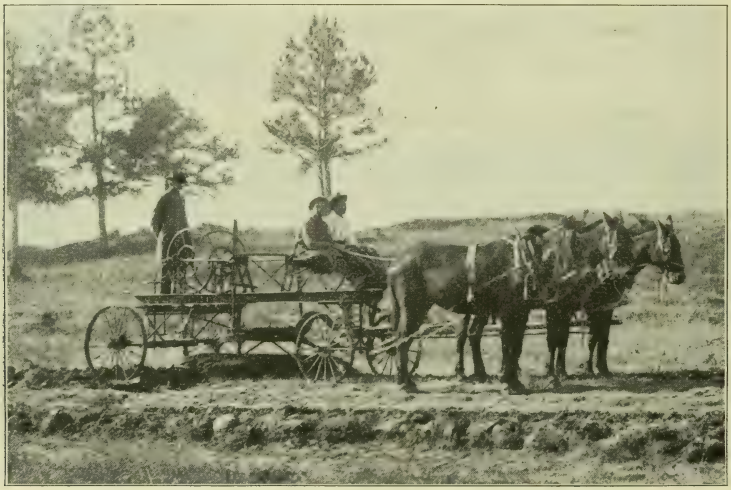


Fig. VI. Showing road machine and same section of road as Fig. 1 before working.

State, that are good because of the work that has been done on them, have been made and maintained with a road machine. It would be interesting, and doubtless very profitable to the State, to know just what one machine with six to eight mules and two men could accomplish if kept constantly at work on the public roads for one year.

Reports from counties.—We wrote to every chancery clerk in the State, enclosing a directed, stamped envelope for reply, asking for certain information concerning the use of road machines and the working of public roads in their respective counties. The clerks in about thirty counties failed to reply to our letter. Seventeen coun-

ties reported that there was no disposition on the part of their boards to have the roads worked by contract, or to change from the present method of warning out the hands once or twice a year. A number of counties reported that there was more or less disposition on the part of their boards of supervisors to have the roads worked by contract.

In Holmes county there are five road machines. The roads are worked by contract at $20.00 per mile.

Madison county works the roads in two districts by contract, the contractor getting about $16.00 per mile and being required to work the roads not less than sixteen feet wide, giving them an oval shape with good side ditches. The contractor is also required to repair all small bridges, the county furnishing the material for the same.

Tunica county pays $75.00 per mile and contracts for two years. Five road machines are in use in the county.

The county convicts are worked on some of the roads in Lauderdale county, while other roads are worked by contract. The average price per mile is about $10.00. The contractor is required to make good side ditches, properly shape the road, and repair small bridges, the material for the bridges being furnished by the county. Swamps are to be causewayed with heavy brush or poles and these covered with dirt.

Four of the principal roads in Lowndes county are worked by contract, the necessary funds being obtained by taxing property along the road, as provided in Section 3931, Code of 1892. Three commissioners are appointed for each road, and they collect the funds and have the roads worked.

Adams county reports comparatively good roads, but that only certain bad pieces of road are worked by contract.

The roads of Clay county are being worked by contract, the average price paid per mile being about $20.00.

The roads in Lincoln county are worked by contract, but we have been unable to get an official report in regard to this work. While in Brookhaven last summer we were told that the county paid $45.00 per mile and that the contracts were for four years.

In Pike county a lumber company has a road machine and has made and maintained a certain amount of road in good condition.

Quitman county reports that the board of supervisors has adopted the plan of having the roads worked by contract, but as yet no work has been done.

Maintaining roads.—When a road is once made good it should be kept so by keeping it constantly in repair, and this work may be done almost entirely with a road machine. If the surface is cut into ruts by travel during wet weather, it should be smoothed as soon as it is dry enough for the machine to work well. It is cheaper to do a few hours work at the right time than to wait until it will require days to repair the damage.

In some sections of the State where the roads get very muddy in winter—e. g. in the flatwoods, delta and prairies—a large amount of loose earth in the middle of the road in the winter season may become very troublesome. Winter is the time to keep such roads in good repair.

Sand beds.—As sand is firmer when it is wet than when it is dry, sand beds should not be drained. By mixing clay with sand a very good earth road may be made, and where the clay is convenient sand beds may be improved by spreading clay over the surface.

Roads on side of slope.—Hill-side roads or mountain-side roads should not slope both ways from the center but should be made so that the slope is from the lower to the upper side of the road. As this arrangement makes one ditch control all the water that falls on the road, the necessary precaution should be taken so that this ditch is not taxed beyond its capacity.

Hard-surface roads.—The object of this bulletin is to furnish information that may be of service in the building of good earth roads, and until this is done it is useless to discuss the surfacing of roads; yet, in some parts of the State, as in the prairies, flatwoods and delta, the people are ready to build more or less hard-surface roads provided they can get good material at reasonable cost. The same is true of city streets and the main roads leading into important towns. It is, therefore, not out of place to describe briefly in this bulletin the making of surfaced roads.

Stone roads are out of the question, as this material is not available, but there is any amount of gravel in different parts of the State. While the gravel pits have never been examined with this end in view, there can be but little doubt that, with so much of this material, we have an abundance of good clay gravel well suited for road purposes. As the railroads are also interested in good country roads they will, most likely, render such aid as they may by giving reasonable rates on gravel for surfacing roads. As embodying the information most needed on this subject we give a report by Mr. J. W. Fox

on the graveled roads of Montgomery county, Alabama. This report was made in August 1899 and is as follows:

REPORT OF THE GRAVEL ROADS OF MONTGOMERY COUNTY, ALABAMA.

The citizens of this county began the building of gravel roads about six years ago, and they now have one hundred miles of these roads completed. They have tried different kinds of gravel, also screen and unscreened gravel. Their experience has been somewhat costly; but the result is that they are now making a road at a reasonable cost, over which two horses pull from two to three tons at any time of the year, which is smoother than a macadam road, which needs very little repairs, and which they think, (judging from their six years experience), is durable. The method by which these results have been accomplished will be of interest to those sections of our State which are now ready to make a beginning in the construction of hard-surface roads.

The first gravel road in this county was made of screened gravel; that is, the clay and small gravel, under five-eights of an inch in diameter, were sifted out and only the clean and large stones were used. During the first two years this road was unsatisfactory; the wheels cut into it, and consequently a load was hard to pull over it. Six inches of clay was put on a part of this road, and the remainder was left for the vehicles to pack. It finally became smooth and hard, and after six years use, without repairs, is to-day in excellent condition.

The next roads were made of unscreened clay gravel (sand gravel is considered unsuitable and is never used). It is put on just as it is taken from the pit, but it must test 50% gravel over a $\frac{5}{8}$ inch screen. These roads, as compared with those made of screened gravel are much cheaper, and the clay gravel cements into a compact solid mass immediately, or, as soon as it is traveled over to any extent; and the test shows that they are durable, having needed no repairs, except to keep side ditches open during the three years which they have been in use.

These gravel roads are constructed in the following way:

The dirt road bed is made about eighteen feet wide, with side ditches sufficient to carry the water. The road is elevated in the center and slopes gradually towards the ditches. If it is necessary to secure the proper drainage, the entire road bed is elevated, the idea being to secure as dry a foundation for the gravel as possible. Ordinarily this is done very satisfactorily and very cheaply with the road machine one team of six or eight mules and two men making about one mile per day. If a considerable embankment has to be made it will cost from five to ten cents per cubic yard, varying with the character of the earth to be moved. As it would be poor economy to build an expensive road up and down steep hills, the road should be relocated to avoid them; or, if this is not practicable, the hills should be cut down to a 5% grade; that is, they should have a maximum rise of five feet to the hundred feet. In some localities this would,

of course, be expensive; but it is not so great an undertaking as one would at first suppose.

After this preparation, the method of gravelling the road is as follows:

Two planks seven inches wide are placed on either side of the center of the road parallel to each other and fifteen feet apart. Midway between them, or along the center of the roadway, iron pins are driven showing nine inches above the ground. Gravel is then dumped from wagons, filling this space to the top of the planks and the pins, thus giving a thickness of gravel of seven inches on sides and nine inches in the center. Earth is then thrown from the ditches filling the spaces between them and the planks. These are called retaining banks and their purpose is to hold the gravel in place until it becomes compact. The planks and the pins are now taken up and moved forward, and another similar section is made, and so on until the road is completed. In two or three days after the road is made the wheels will have cut into it and displaced the gravel to some extent; over it a road machine is then run once each way, smoothing the gravel and putting it slightly towards the center. The road is now complete and is ready for the heaviest traffic and for any kind of weather.

The cost of this road is made up of the following items:

1848 cubic yards to the mile at $8.00 per car of 20 cubic yards, delivered on railroad at the nearest point of the dirt road; cost of hauling, which will vary with the distance, and the cost of putting on the gravel, which is small.

In our State the cost of gravel delivered on railroad will vary with different localities, but the railroads will doubtless co-operate with any community wishing to make gravel roads. While gravel is not found in every county, the supply in Mississippi seems to be abundant. The roads described above were fifteen feet wide. Our country roads need be graveled only eight feet wide, having a dirt track of the same width. Besides giving a soft road for use during the summer and fall, this arrangement would cause gravel tracks to last twice as long, and would reduce the original cost almost one-half. In this way a first class gravel road may be built for less than $1,000 per mile.

I deem it unnecessary to discuss in this report the benefits of good roads, but there is one good result of the roads just described that is so striking that I shall mention it here. It is a fact that as soon as these roads were built, or as soon as any particular road was completed, property along this road invariably advanced from 25% to 60% in value; and, better still, farmers who were dissatisfied with their homes and had advertised them for sale took them off the market as soon as the road was completed.

My observation has convinced me of two things: (1) that gravel makes a first class hard-surface road, and (2), that the road problem in Mississippi will be solved eventually by the use of gravel.

MISSISSIPPI AGRICULTURAL EXPERIMENT STATION

BULLETIN No. 68.

Analyses of Commercial Fertilizers on Sale In the State.

CHEMICAL LABORATORY.

AGRICULTURAL COLLEGE, MISS

SEPTEMBER 1ST, 1901.

Clarion-Ledger Print, Jackson, Miss.

Mississippi Fertilizer CONTROL.

INSPECTION AND ANALYSES OF FERTILIZERS,

BY THE CHEMICAL DEPARTMENT
OF THE

Mississippi Agricultural & Mechanical College

W. F. HAND, STATE CHEMIST.
J. S. CARROLL, ASSISTANT CHEMIST.
E. B. FERRIS, ASSISTANT CHEMIST.
I. D. SESSUMS, ASSISTANT CHEMIST.

This Bulletin contains the analyses of the principal brands of commercial fertilizer that have been found on the Mississippi markets during the season of 1900-1901. The samples were drawn by the regular fertilizer inspector, and, in view of the care with which this work has been done, it is believed that the analyses represent fairly the chemical composition and comparative value of the goods as bought by the dealers and farmers of the State.

NOTE—The inspection of commercial fertilizers is by law done under the supervision of the Professor of Chemistry at the College, who is State Chemist. The results being considered of agricultural value are sent out by the Experiment Station. All communications in regard to the Bulletins or analyses should be addressed to State Chemist.

The limited number of brands offered for sale at the present time has made a thorough inspection possible, quite a large number of samples sold under the same brand name being analyzed. In every case where three or more samples are given the *average* analysis and relative commercial value have been calculated. The averages are set in bold type, and, for convenience, the guarantees of the manufacturer are printed in italics immediately below. A comparison can be made, therefore, at a glance. Some of the more important brands have received especial attention, and the average of fifteen or twenty analyses should, without doubt, establish a record for the season for that brand. By this procedure the effect of accidental variations and errors is reduced to a minimum. Those who intend to purchase fertilizers during the fall and spring should examine the results carefully. In so far as fertilizers are concerned, there is certainly more in an analysis than in a name. Good analyses, have built up, and will always build up reputations of worth for the name of the brand and manufacturer.

GENERAL CHARACTER OF BUSINESS.

An inspection of the tables of analyses and guarantees will show that, as a general rule, the fertilizers sold last season have fully sustained the claims made by the manufacturers. A few samples, however, have only approximated the guaranteed analysis and some have fallen somewhat below it. All manufacturers doing business in our State have cheerfully complied with every requirement of the fertilizer law, and they have generally offered only honest goods.

SAMPLES ANALYZED FREE OF CHARGE.

The State Chemist is required by law to analyze *free of charge* all fair samples of fertilizers properly certified and prepared that may be submitted to him by farmers and other purchasers.

In order that the certificate of analysis of the State

Chemist may be of value as evidence of the percentage of the valuable elements contained in a fertilizer, it is necessary that the sample be a *fair* one, properly certified and prepared. The purpose of the law is to secure fair dealing on the part of all concerned in the purchase and sale of an article, the value of which can only be ascertained by chemical analysis. Blank forms of certificate that must accompany samples sent for analysis will be promptly forwarded on application. These blanks contain specific directions for properly sampling any lot of goods, and they must always be filled out and signed by the person sending the sample, and signed also by two witnesses, who must be disinterested parties, before a certificate of analysis can be given. Dealers and farmers are encouraged to forward samples of their goods for examination; the work will be done as promptly as possible.

FERTILIZER VALUATIONS.

The elements of commercial value contained in any fertilizer, viz: Phosphoric acid, in its several forms, nitrogens, and potash, have a definite value in the markets; they are worth so much per pound. The raw materials used by manufacturers in preparing their various mixtures are bought by them on the basis of the percentage of these elements carried by the various substances accessible. The value of the mixed fertilizer can, therefore, be found by simple calculation. It is evident that the value of mixed fertilizers and acid phosphates is measured by the cost of the raw materials plus the cost of manipulation, freight, commissions, etc.

A chemical analysis shows the number of pounds and fractions of a pound of the various forms of phosphoric acid, nitrogen, and potash contained in one hundred pounds of the mixture. If the price per pound is known, the value of one hundred pounds, and, consequently, of a ton, can be found at once.

The relative commercial values given in the tables are used for comparison only; *they are not intended to establish a*

selling price or to represent the crop producing power. This method of comparing one brand with another is justified only by the fact that many purchasers do not fully understand the terms used in stating the analyses.

All values contained in this bulletin are calculated on the basis of the following prices per pound of the essential elements :

	Per Pound.
For Nitrogen	16¼ cents
For Potash.....	5 cents
For Water-Soluble Phosphoric Acid.....	5½ cents
For Citrate-Soluble Phosphoric Acid.....	5 cents
For Phosphoric Acid in fine bone.....	3 cents
For Phosphoric Acid in medium and coarse bone	2½ cents

Laboratory Num'r.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	ARMOUR PACKING CO., Kansas City, Mo.	
1766	Helmet Br'nd Fer. No. 271	Canton Cotton W'house Co., Canton.
1883	"	" "
1993	"	Fowler & Fowler, McCool.
2008	"	Barney, Johns & Co., Gloster.
2085	"	E. M. Carter & Co, Centreville.
2086	"	R. W. Fagan & Co., Waynesboro.
2087	"	W. L. Bourland, Amory.
		Average
		Guarantee
1985	Helmet Br'nd Fer. No. 281	C. W. Young, Ripley.
		Guarantee
2064	Helmet Br'nd Fer. No. 285	J. A. Mehaffey, Steens
		Guarantee
1984	African Cotton Grower.	W. L. Bourland, Amory.
		Guarantee
	A. D. ADAIR & MCCARTY BROS. Atlanta, Ga.	
1887	Furman's H.G. Dis. Bone.	J. F. Walker, Iuka.
		Guarantee
1888	Farish Furman Formula.	J. F. Walker, Iuka.
1987	"	Thomas Blakney, Burnsville.
		Guarantee
	BIRMINGHAM FERT. CO. Birmingham, Ala.	
1891	Birmingham H. G. Fert.	Myers & Egger, Caledonia.
1892	"	Gilmore & May, Amory
		Guarantee
1974	Bi'm'gham H.G.AcidPhos	Gilmore & May, Amory
		Guarantee
	SOLD BY BLUMENFELD & FRIED, Ackerman. Miss.	
1907	Blumenfeld & Fried's Improved Mixture	Blumenfeld & Fried, Ackerman
2019	Blumenfeld & Fried's Improved Mixture	" "
		Average
		Guarantee
	CANTON COTTON WAREHOUSE CO., Canton, Miss.	
1848	Acid Phosphate	Canton Cotton W'house Co., Canton.

Laboratory Num'r.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per c'nt.	Potash—Per cent.	Relative Value per ton
		Water—soluble	Citrate—soluble.	Available.	Insoluble.			
1766	5.48	2.12	5.76	7.88	2.28	1.65	1.58	15.04
1883	5.00	1.68	6.77	8.45	1.88	1.60	1.48	15.30
1993	6 82	1.30	6.90	8.20	2.24	1.97	1.40	16.13
2008	11.90	1.51	7.13	8.64	2.25	2.00	1.47	16.76
2085	4.59	1.55	6 97	8.52	1.62	1.72	1.33	15.60
2086	6.34	1.24	6.30	7.54	2.26	1.84	1.61	15.25
2087	6 08	1.37	7.15	8.52	2.11	2.10	1.43	16.91
	6 60	**1.54**	**6.71**	**8.25**	**2.09**	**1.84**	**1.47**	**15.85**
		5.00	*2.00*	*7 00*	*1.50*	*1.50*	*1.00*	*13.38*
1985	6.51	2.55	7.04	9.59	2.74	1.94	1 26	17.41
		5.00	*3.00*	*8.00*	*1.50*	*1.65*	*1.00*	*14.86*
2064	3.49	2.75	6.77	9.52	1.91	1.70	5.96	21.28
		5.00	*3.00*	*8.00*	*1.50*	*1.65*	*5.00*	*18.86*
1984	6.03	3.40	6.15	9.55	3.94	2.64	3.41	21.88
		5.00	*4.00*	*9.00*	*1.00*	*2.50*	*3.00*	*20.63*
1887	12.35	11.26	2.36	13.62	.72	.....	.....	14 75
		9.00	*3.00*	*12.00*	*2.00*	.....	....	*12.90*
1888	9.52	9.04	3.18	12.22	.70	.....	1.74	14.86
1987	10.85	7.57	2.96	10 53	1.36	.....	1.98	13.27
		7.00	*3.00*	*10.00*	*2.00*	.....	*2.00*	*12.70*
1891	15.35	11.81	1.03	12..84	.77	1.88	2.91	23.04
1892	13.98	8.84	3..60	12.44	2.10	1.62	2.61	21.20
		8.00	*2.00*	*10.00*	*2.00*	*1.64*	*2.00*	*18.13*
1974	13.84	12.11	2.55	14.66	.65	.....	.....	15.87
		12.00	*2.00*	*14.00*	*2.00*	.....	.....	15.20
1907	12.66	7 09	2.48	9 57	1.28	1.77	2.09	18.12
2019	12.13	7.89	2.51	10 40	1.73	1.66	1.81	18.40
	12.39	**7.49**	**2.49**	**9.98**	**1.51**	**1.72**	**1.95**	**18.26**
		7.50	*2.00*	*9.50*	*1.00*	*1.75*	*1.75*	*17.69*
1848	13.15	13.62	2.60	16.22	2.70	.....	.....	17.58

Laboratory Num'r.	Name of Brand and Manufacturer.	Where and From Whom Collected.
1915	Acid Phosphate	Canton Cotton W'house Co., Canton.
		Average
		Guarantee
	CAPITAL FERT. & MFG. CO Jackson, Miss.	
1767	H. G. Acid Phosphate	Capital Fert. and M'f'g Co., Jackson
1768	"	Collins Bros., Magnolia
1815	"	Capital Fert. and M'f'g Co., Jackson
1864	"	W. C. Ellis, Steen's Creek
1933	"	Blumenfeld & Fried, Ackerman
2133	"	W. H. Barron & Co., Crystal Spr'gs
		Average
		Guarantee
1771	Nonpareil	Becker, Lyell & McGrath, Wesson.
1772	"	Capital Fert. and M'f'g Co., Jackson
1860	"	E. H. Walker, Mount Olive
1861	"	W. C. Ellis, Steen's Creek
1931	"	J. R. Bush, Braxton
1932	"	Blumenfeld & Fried, Ackerman
1934	"	Lampton Mercantile Co., Magnolia.
1951	"	Stingley, Taylor & Co., Pelahatchie
1973	"	Lampton Mercantile Co., Magnolia.
2015	"	Moore Bros., Morton.
2020	"	Gaddis & McLaurin, Bolton
2137	"	Ford Bros., Centreville
2138	"	Daniel & Zwirn, Brookhaven
2139	"	W. J. Davis, Terry
2140	"	A. L. Hoye, Lake
2141	"	W. H. Barron & Co., Crystal Spr'gs.
2142	"	J. L. Moyse & Bro., Summit
2143	"	A. E. Kelly, Kosciusko
2144	"	M. J. L. Hoye's Son, Newton
2145	"	Thompson & Son, Brandon
2146	"	G. H. Banks, Forest
		Average
		Guarantee
1862	Red Star Brand	S. Alcus, Summit
1950	"	W. C Ellis, Magee
1994	"	G. W. Winters, McCool
2050	"	J. D. Gambrell, Taylorsville
2135	"	McMullen & Bolton, Newton
2136	Red Star Brand	M. L. Brumfield, D'Lo
		Average
		Guarantee
1972	Mississippi Guano	Howie Bros., Morton

Laboratory Num'r.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per c'nt.	Potash—Per cent.	Relative Value per ton.
		Water—soluble.	Citrate—soluble.	Available.	Insoluble.			
1915	13.17	14.25	2.69	16 94	2.14	.....	.....	18.37
	13.16	**13 93**	**2 65**	**16 58**	**2 42**	.....	.....	**17 97**
		13 00	*2.00*	*15.00*	*1.00*	.....	.....	16.30
1767	13.65	10.80	5.22	16.02	1.66	.....	.....	17.10
1768	9.62	8 01	4 01	12 02	1.13	.....	.....	12.82
1815	10.66	7.02	4 98	12.00	1.34	.....	.....	12.70
1864	9 90	7.56	4 28	11.84	1.30	.....	.....	12.60
1933	9.82	7 78	5.08	12.86	.87	.....	.....	13 64
2133	9 27	6 75	4.96	11.71	1 41	.....	.....	12 39
	10.49	**7.99**	**4.75**	**12 74**	**1.28**	.....	.....	**13.54**
		10.00	*2.00*	*12.00*	*1 00*	....	....	*13.00*
1771	11.25	6.10	2.21	8 31	1.23	1.57	2.05	16.07
1772	1?.52	5 43	3.25	8.68	.51	1.56	2.28	16.57
1860	11.85	6.51	2.41	8 92	1.37	1.17	1.72	15.09
1861	13.50	5 96	3 39	9.35	.45	1.35	2 19	16.52
1931	10.72	6 10	3 67	9.77	.91	1.64	1.92	17.63
1932	12.10	5.88	3.32	9.20	.88	1.56	2.16	17.02
1934	9 58	6.14	3 57	9 71	.91	1.68	2.23	18 01
1951	9 97	6 74	4.12	10.86	.67	1.42	2.02	18.17
1973	12.42	5 83	3 15	8 98	1.04	1.46	2.14	16.45
2015	13 08	6 81	2.10	8.91	.86	1 53	2.12	16.68
2020	11.93	6.42	2.79	9.21	.72	1.84	2.22	18 05
2137	10.12	6 20	3 62	9 82	.96	1.38	2.07	17 00
2138	11.21	6.69	2.70	9 39	.88	1 69	2.22	17.77
2139	13.77	5.44	3.10	8.54	.75	1.46	2.15	15.98
2140	11.46	7.20	2.42	9 62	1.02	1.53	2.09	17.40
2141	12.30	6.05	3.14	9 19	1.00	1.25	2 08	15.89
2142	13.86	6.03	3.52	9.55	1.09	1.36	1.90	16.47
2143	14 10	5.60	3.20	8 80	.97	1 56	2.09	16.51
2144	12.22	6.04	3 01	9.05	.90	1.51	2.10	16 66
2145	10 54	6.49	3 06	9.55	.96	1 54	2.01	17.21
2146	11 57	6.08	3.59	9.67	1.01	1.41	2.01	16.87
	11.90	**6 18**	**3 11**	**9.29**	**.91**	**1 50**	**2.08**	**16 86**
		7 00	*2.00*	*9.00*	*1.00*	*1 50*	*2.00*	*16.58*
1862	12 06	5.91	3.34	9.25	.92	1.46	2.17	16.76
1950	9.62	6.20	3 54	9 74	.77	1.59	2.32	17.85
1994	11.78	5.13	3 51	8.64	.36	1 92	2 31	17.70
2050	10.98	6.75	3.43	10.18	1.05	1 67	2 34	18.62
2135	14.03	7.16	3 52	10 68	.99	2.17	2 14	20.59
2136	10.67	6 24	3 51	9.75	1.06	1.41	2.05	17.00
	11 52	**6 23**	**3 48**	**9.71**	**.86**	**1 70**	**2.22**	**18 08**
		7 00	*2.00*	*9.00*	*1.00*	*1.50*	*2 00*	*16 58*
1972	10.71	6.19	3 68	9 87	1.01	1.38	2.01	16.98

Laboratory Num'r.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2134	Mississippi Guano.....	Max Priebatsch, Brookhaven.....
		Average .....
		Guarantee.....
1863	Our Vegetable Grower ...	J. C. Harvey, Gallman .....
		Guarantee.....
1998	Producer Brand.....	E. F. Webb & Co., Summit.....
		Guarantee.....
2034	Kainit.....	Lilly & Dunn, Summit.....
		Guarantee.....
	CONTINENTAL FERT CO. Nashville, Tenn.	
1886	Eddystone Sol. Guano....	J. F. Walker, Iuka.....
1908	"	J. D. Carr, Ackerman .....
2071	"	T. W. Pylant & Bro., Purvis.....
2072	"	J. A. Mehaffey, Steens .....
		Average .....
		Guarantee.....
1942	Sunny South Acid Phos..	T. W. Pylant & Bro., Purvis.....
1978	"	J. A. Mehaffey, Steens.....
2018	"	J. D. Carr, Ackerman.....
2070	"	J. F. Walker, Iuka.....
		Average .....
		Guarantee.....
	EAGLE COTTON OIL CO., Meridian, Miss.	
2083	Eagle H G. Acid Phos...	Eagle Cotton Oil Co., Meridian.....
2084	"	S. H. Floyd, Shubuta.....
		Average .....
		Guarantee.....
	HAZLEHURST OIL MILL AND FERTILIZER CO. Hazlehurst, Miss.	
1814	Acid Phosphate.....	H'hurst Oil Mill & Fer. Co., H'hurst
		Guarantee.....
1996	Imperial Fertilizer.....	Wilburn Bros., Pickens .....
2005	"	H'hurst Oil Mill & Fer. Co., H'hurst
2021	"	Smith & Decell, Wesson.....
2082	"	Lotterhos & Huber, Crystal Springs
		Average .....
		Guarantee.....
2037	Kainit.....	J. R. Gillaspy, Crystal Springs.....
		Guarantee.....
	JACKSON FERTILIZER CO. Jackson, Miss.	
1882	H. G. Acid Phosphate ...	W. H. Chambliss & Son, Newton ...
1975	"	R. D. J. Smith, Centreville.....

Laboratory Num'r.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per c'nt.	Potash—Per cent.	Relative Value per ton.
		Water—soluble	Citrate-soluble	Available.	Insoluble.			
2134	11.03	5.33	3.60	8.93	.69	1.62	2.42	17.15
	10 87	**5.76**	**3.64**	**9.40**	**.85**	**1.50**	**2.21**	**17 06**
		7.00	*2.00*	*9.00*	*1.00*	*1.50*	*2.00*	*16.58*
1863	10.48	5.54	3.35	8.89	.87	2.57	2.61	20.41
		6.00	*2.00*	*8.00*	*1.00*	*2.25*	*3.50*	*19.41*
1998	11.55	5.65	3.31	8.96	.37	1.83	2.29	17.76
		7.00	*2.00*	*9.00*	*1.00*	*1.50*	*2.00*	*16.58*
2034	3..49	.....	.....	.....	.....	.....	12.55	12.55
	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1886	10 58	7.94	3.99	11.93	4.04	1.10	.81	17.11
1908	9.96	6.86	3.18	10.04	3.70	1.66	1.28	17.40
2071	9.17	6.84	3.78	10.62	3.35	1.66	1.15	17.85
2072	8.07	6 17	4.45	10.62	3.21	1.58	1.05	17.42
	9 44	**6 95**	**3..85**	**10 80**	**3 57**	**1.50**	**1 07**	**17.44**
	.....	*7.00*	*2.00*	*9.00*	*1 00*	*1.65*	*1.00*	*16.06*
1942	10.24	9 52	4.19	13.71	3 02	.....	.....	14.66
1978	10.70	10.72	3.44	14.16	4.09	.....	.....	15.23
2018	9.05	9 45	3.78	13..23	1.96	.....	.....	14.18
2070	11.21	11.28	3.14	14.42	4.73	.....	.....	15 55
	10.30	**10 24**	**3.64**	**13 88**	**3 45**	.....	.....	**14 90**
	.....	*11.00*	*2.00*	*13.00*	*1.00*	.....	.....	*14.10*
2083	9.95	11.82	2.84	14.66	1.39	.....	.....	15.84
2084	13.45	12.03	2.72	14.75	1.80	.....	.....	15.95
	11.70	**11 92**	**2.78**	**14.70**	**1.59**	.....	.....	**15 89**
	.....	*11.00*	*2.25*	*13.25*	*.75*	.....	.....	*14.35*
1814	14.12	12.46	2.84	15.30	3.24	.....	.....	16 55
	.....	*12.00*	*2.00*	*14.00*	*1.00*	.....	.....	*15 20*
1996	11.00	7.61	2.88	10.49	2 43	1.84	1.93	19.16
2005	11.04	7.32	2.94	10.26	2.38	1.92	1.78	19 01
2021	11.15	7.45	3.06	10.51	2.10	1.71	2.11	18.92
2082	10.60	7.78	2.64	10.42	2.02	1.96	1.83	19 40
	10.95	**7.54**	**2.88**	**10.42**	**2 23**	**1.86**	**1 91**	**19 12**
	.....	*7.00*	*2.00*	*9.00*	*1.00*	*1 65*	*1.75*	*16.81*
2037	4 27	.....	.....	.....	.....	.....	11.65	11.65
	.....	...	. ..	.....	.....	.....	*12.00*	*12.00*
1882	11 27	9.58	3.54	13.12	1.92	.....	.....	14.08
1975	11.18	8.66	4.95	13 61	2.12	.....	.....	14.48

Laboratory Numb'r.	Name of Brand and Manufacturer.	Where and From Whom Collected.
1976	H. G. Acid Phosphate	N. B. Gilliland & Co., Kosciusko
2017	" "	" "
2023	" "	Irving & Torbert, Wiers
2124	" "	T. M. Heidelberg, Heidelberg
2125	" "	T. M. Steele, Forest
		Average
		Guarantee
1773	Royal C Brand	Canton Cotton Wareh'e Co., Canton
1774	"	H. E. Strahan, Hazlehurst
1809	"	C. Atkinson Sons Co., Summit
1835	"	J. P. Myer, Ellisville
1846	"	Canton Cotton Wareh'e Co., Canton
1879	"	J. M. Stephenson, Morton
1880	"	Johnson-Woodward Co., Mt. Olive
1922	"	Turner & Taylor, Hattiesburg
1923	"	F. M. Brooks, Weathersby
1926	"	I. W. Lampton & Bro , Columbia
1927	"	Barney, Johns & Co., Gloster
2052	"	A. C. Seavy, Brookhaven
2053	"	H A. Busick, Brandon
2126	"	Sherman & Davis, Brookhaven
2127	"	M. D. Graham & Co., Forest
2128	"	Simpson Mer. Co., Terry
2129	"	Blackston Mer. Co,, Winona
2130	"	Lotterhos & Huber, Crystal Springs
2131	"	R. D. J. Smith, Centreville
2132	"	Stingley, Taylor & Co , Pelahatchie
		Average
		Guarantee
1881	Vegetable and Fruit	Lottheros & Huber, Crystal Springs
		Guarantee
2033	Kainit	Wm. Atkinson & McDonald, Wesson
		Guarantee
	LOUISVILLE FERT. CO., Louisville, Ky.	
1847	Eagle Bone and Potash	N. B. Langford, Canton
		Guarantee
	KOSCIUSKO OIL MILL AND FERT. CO., Kosciusko, Miss.	
1912	H. G. Acid Phosphate	Potts-Jackson Co., Kosciusko
2013	" "	" "
2014	" "	" "
2043	" "	" "
		Average
		Guarantee

Laboratory Numb'r.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative Value per ton.
		Water—soluble	Citrate—soluble	Available.	Insoluble.			
1976	11.46	9 89	3.25	13 14	2.38			14.13
2017	10.93	9 68	3.45	13.13	2.29			14.10
2023	10.58	9 20	3.73	12 93	2.19			13.85
2124	11.08	8.39	5.66	14.05	1.43			14.89
2125	11.10	8.61	5.39	14.00	1.28			14.86
	11 08	**9.14**	**4 28**	**13 42**	**1.94**			**14.34**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
1773	15.54	5.96	3.37	9.33	.32	1.52	2.04	16 91
1774	12.70	5 53	2.92	8.45	1.27	1.44	1.85	15.53
1809	9.23	6.55	2.50	9.05	1.24	1.71	1.88	17.14
1835	10.85	6 59	2 28	8.87	1.72	1.60	1.86	16.59
1846	13.33	5.94	3.85	9.79	.27	1.55	2 10	17.52
1879	10.00	6.51	2.79	9.30	1.48	1.59	1.90	17.02
1880	10·22	6.87	1.93	8.80	1.75	1.52	1.97	16.40
1922	10.53	7.07	2.39	9.46	1.64	1.61	2.07	17.47
1923	10.48	6.45	2.33	8.78	1.79	1.67	1.93	16.79
1926	9.55	6.40	2.73	9.13	1.32	1.64	2.05	17.15
1927	9.51	6.14	2.77	8.91	1.34	1.76	1.97	17.21
2052	10.11	6.77	2 72	9.49	1.15	1.70	1.99	17.68
2053	9.82	7.00	2.80	9.80	1.20	1.74	2.06	18.22
2126	9.70	6.01	3.64	9.65	.43	1.71	2.03	18.84
2127	10.87	6.74	2.10	8.84	1.66	1.56	1.91	16.49
2128	11 06	6.97	2 25	9.22	1.42	1.79	1.82	16.55
2129	9.72	6.67	2.27	8.94	.60	1.72	1.92	17.12
2130	10.48	6 14	2.93	9.07	1.32	1.71	2 01	17.25
2131	9.10	7.06	2 57	9.63	.90	1.72	1.97	17.90
2132	10.57	6 40	3.94	10.34	1.92	1.78	2.19	18.96
	10·66	**6.49**	**2.75**	**9.24**	**1.24**	**1.65**	**1.98**	**17.24**
		6.00	*1.60*	*7.60*	*1.00*	*1.55*	*1.80*	*15 04*
1881	9 25	4 99	1.98	6.97	1.28	3.18	4.43	22.23
		3.00	*3.00*	*6.00*	*1.00*	*3.00*	*4.00*	*20.05*
2033	4 54						12.16	12.16
							12.00	*12.00*
1847	10.05	4.99	6 00	10.99	7.61		1.80	13.29
		8.00	*2.00*	*10.00*	*1.00*		*2.00*	*12.80*
1912	11.22	9.08	3.14	12.22	4.78			13.13
2013	10 07	11.87	2.83	14.70	4.60			15.89
2014	11 08	11.32	2.87	14.19	5.86			15.32
2043	9 48	11.55	2 94	14.49	5.27			15.65
	10 46	**10 95**	**2.95**	**13 90**	**5.13**			**15.00**
		11.00	*2.00*	*13.00*	*1.00*			*14 10*

Laboratory Num'r.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	SOLD BY MARBACH & EAGAN, Crystal Springs, Miss	
2004	Bat Guano	Lotterhos & Huber, Crystal Springs
2030	"	I. M. Eagan, Crystal Springs
		Guarantee
	MERIDIAN FERT. FACT'RY Meridian, Miss.	
1919	Meridian Eng. Acid Pho.	J. W. McKay, Waynesboro
1956	"	F. W. Bransby, Macon
2031	"	N. P. Welborn & Co., Laurel
2202	"	Fernwood Lumber Co., Fernwood
2203	"	T. B. Gaddis, Morton
2204	"	McGehee & Causey, Gloster
		Average
		Guarantee
1808	Meridian So. Acid Phos.	T. C. Edwards, Shuqualak
1876	"	J. L. Miller, Gallman
1877	"	Rew & McClinton, Newton
1960	"	W. W. Harris, Iuka
2205	"	R. E. Dear, Enterprise
2206	"	Mohler Bros., Mount Olive
		Average
		Guarantee
1764	Meridian Home Mixture	J. McGrath & Sons, Brookhaven
1787	"	R. Watts & Co , Seminary
1788	"	Patrick & Franklin, Magee
1843	"	McClain & Ratcliff, Gloster
1844	"	McLeod-Kennedy Co., Hattiesburg
1845	"	G. H. Rankin, Columbia
1916	"	Sandersville Mer'tile Co., Sandersv.
1918	"	W. L. Weems, Shubuta
1920	"	J. M. Gann, Poplarville
1921	"	G. R. Edwards, McCool
1948	"	Holloway & McRaney, Collins
1958	"	Hitt, Hart & Blackston, Winona
1959	"	W. A. Abrams, Baldwyn
2010	"	J. H. Williams, Bolton
2051	"	McClain & Ratcliff, Gloster
2207	"	Ross Bros., Pelahatchie
2208	"	Mathis & Cates, Corinth
2209	"	W. H. Gillaspy, Hickory
2210	"	W. B. Richardson, Newton
2211	"	B. F. Harris, State Line
2212	"	J. S. Eaton & Bro., Taylorsville
2213	"	Johnson-Hand Co., Ellisville
2214	"	I. N. Varnado, Osyka

Laboratory Num'r.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per c'nt.	Potash—Per cent.	Relative Value per ton.
		Water—soluble.	Citrate—soluble.	Available.	Insoluble.			
2004	28.40	.....	.....	.....	8.19	4.60	.67	19.72
2030	21.34	.....	.....	.....	8.00	4.58	.53	19.42
					5.00	*4.25*	.65	16.96
1919	15.85	9 93	4.73	14.66	1.14	.....	.....	15.65
1956	14.38	11.19	3.12	14.31	3.04	.....	.....	15.43
2031	14.11	10.34	3 61	13.95	2.21	.....	.....	14.98
2202	13.45	10 94	4..55	15.49	1.06	.....	.....	16.58
2203	13.73	10.04	3.97	14.01	1.22	.....	.....	15.01
2204	12.40	10.11	5.60	15.71	1.22	.....	.....	16.72
	13 99	**10 43**	**4 26**	**14 69**	**1 65**	.....	.....	**15 73**
	.....	*10 00*	*2.00*	*12.00*	*.50*	.....	.....	*13.00*
1808	13.95	10.77	4.22	14.99	1.10	.....	.....	16 07
1876	17.90	10.69	3.56	14.25	.77	.....	.....	15 32
1877	15.63	11.39	3.24	14.63	1 02	.....	.....	15.77
1960	14.92	9.25	5 02	14.27	1.62	.....	.....	15.20
2205	13.97	10.30	5.14	15.44	1.28	.....	.....	16.47
2206	12.67	12.56	3.54	16.10	.69	.....	.....	17.36
	14 84	**10 83**	**4 12**	**14 95**	**1 08**	.....	.....	**16 03**
	.....	*12 00*	*2.00*	*14 00*	*.75*	.....	....	*15.20*
1764	12.21	6.72	2.57	9.29	.82	1 80	2.40	18.21
1787	13 06	7.13	3.53	10.66	.67	1 40	2.14	18 06
1788	12.49	6.84	3.54	10.38	.83	1.54	2.26	18.33
1843	16 36	6.20	2.35	8.55	.35	2.02	2.36	18.07
1844	13 57	7 46	2.51	9 97	.69	1.68	2.13	18.31
1845	17.09	6.64	2.15	8.79	.37	1 90	2.24	17.87
1916	12 00	7.07	2.25	9.32	2.82	1.75	2.24	17.96
1918	11.71	7.02	2.68	9.70	2.65	1.92	1.68	18.32
1920	13.25	7.61	3.05	10.66	1.02	1.77	1 99	19.16
1921	12 90	7 29	2.83	10.12	.87	1.73	2 24	18.71
1948	12 45	6 95	2.47	9.42	2.64	1.82	2.04	18.07
1958	11.92	7 78	2 31	10.09	1.89	1.82	1.95	18.73
1959	13.58	7.43	2.79	10.22	1.92	1.82	1.59	18.47
2010	11 26	6.81	1.20	8.01	2.64	1.92	1.78	16.71
2051	11.57	6 32	3.07	9.39	2.46	1.51	1.84	16.77
2207	12.30	6.77	2.76	9.53	2.37	1.90	1 81	18.19
2208	12.58	7.68	2.43	10.11	1.96	1.76	1.89	18.49
2209	13.75	7.82	2.37	10.19	1.52	1.60	1.86	18 03
2210	12.60	7.05	2 43	9.48	2 48	1.92	1.61	18.04
2211	13.50	7.79	3.11	10.90	.77	1.75	1.67	19.04
2212	13.47	7.52	2.94	10.46	.83	1.80	1.97	19.03
2213	14.30	6.13	2.95	9.08	.75	1.80	2.62	18.16
2214	13.74	7.07	2.75	9 82	.90	1.82	2.32	18.76

Laboratory Num'r.	Name of Brand and Manufacturer.	Where and From Whom Collected
2215	Meridian Home Mixture..	Lann & Carter, Aberdeen.....
2216	"	Kennedy & Co., Wiggins ....
		Average ....
		Guarantee.....
1842	Meridian Blood and Bone.	McClain & Ratcliff, Gloster ....
1917	"	S H. Floyd, Shubuta ....
1954	"	A. Roberts & Co., Lauderdale .....
2016	"	A. Mangold & Co., Hazlehurst .....
2200	"	J. H. South, Steen's Creek ....
2201	"	Matthews & Cotten, Iuka ....
		Average ....
		Guarantee.....
1875	Meridian Farmer's Friend	T. A. Lee, Wesson ....
1961	"	W. J. Brown & Bro., Kosciusko ....
		Average ....
		Guarantee.....
1995	Meridian Veg'ble Grower.	Seward & Gaston, Ackerman .....
2199	"	J. L. Miller, Gallman ....
		Average ....
		Guarantee.....
2198	Meridian Soluble Guano..	J. W. Elliott, Magnolia .....
		Guarantee.....
1878	German Kainit.....	Waddell, May & Barnes, Brandon..
		Guarantee..... .....
	MOBILE PHOSPHATE CO., Mobile, Ala.	
1781	I. X. L. Acid Phosphate..	Winner & Meyer, Meridian .....
1854	"	T. C. Edwards, Shuqualak.....
1855	"	Winner & Meyer, Meridian ....
2109	"	T. B. Gaddis, Morton ....
2110	"	J. L. Wells, Hickory .. ..
2111	"	Seward & Gaston, Ackerman ....
2112	"	J. P. Myer, Ellisville ....
2113	"	S. H. Floyd, Shubuta .....
		Average ....
		Guarantee.....
1782	Mobile Standard Guano...	Winner & Meyer, Meridian .....
1816	"	" "
1820	"	Geo. L. Welsh & Son, Shuqualak ..
1849	"	Burkett & Burrow, Columbia.....
1928	"	Wetherbee & Huggins, Waynesboro
1929	"	W. L. Weems, Shubuta .....
1930	"	J. P. Myer, Ellisville ....
1949	"	B. Shia & Co., Collins .....
1969	"	Barnett-Davis Supply Co., Boonev'le
2118	"	The J. P. Myer Mer. Co., Taylorsv'le

Laboratory Num'r.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per c'nt.	Potash—Per cent.	Relative Value per ton.
		Water—soluble.	Citrate—soluble.	Available.	Insoluble.			
2215	12.23	6.09	3.86	9.95	2.07	1.85	1.79	18 36
2216	13..10	6 75	2 97	9.72	1.19	1.89	1.84	18.38
	13 08	**7 04**	**2 71**	**9 75**	**1 50**	**1.78**	**2 01**	**18 25**
	.....	*7.50*	*2 00*	*9 50*	*.75*	*1 75*	*1.75*	*17.69*
1842	13 80	7.14	3 31	10.45	1.88	1.79	1 86	18.84
1917	11.45	6 92	2.76	9.68	2.81	1.87	2.16	18 61
1954	14 28	7.79	2 02	9.81	2.16	1.91	1.87	18.67
2016	13.36	7.11	2 80	9.91	1.78	1.75	1.97	18.28
2200	17 47	8.16	2.89	11.05	.97	1 65	1.71	18.94
2201	15 07	6 84	3 40	10.24	1.70	1.67	1.74	18.09
	14 24	**7 33**	**2 86**	**10 19**	**1.88**	**1 77**	**1 90**	**18.57**
	.....	*7.50*	*2.00*	*9.50*	*1.25*	*1.75*	*1.45*	*17.69*
1875	12.94	6.26	2.75	9.01	1.55	1.77	1 28	16.69
1961	12 84	6 96	4 75	11 71	1.82	1.05	1.34	17.16
	12.89	**6 61**	**3.75**	**10 36**	**1.68**	**1 41**	**1.31**	**16 92**
	.....	*6.00*	*1 00*	*7.00*	*.50*	*1.65*	*1.00*	*13.96*
1995	10 36	6 77	2 47	9.24	6 75	1.46	4.71	19.37
2199	13.00	7 01	2.76	9 77	3.35	2 00	4.44	21.41
	11.68	**6 89**	**2 62**	**9.51**	**5 05**	**1 73**	**4 57**	**20.39**
	....	*5.00*	*1 00*	*6.00*	*.50*	*2.50*	*6.00*	*20.63*
2198	15 00	8 00	2 33	10 33	.73	1.68	2.09	18.68
	.....	*7 50*	*2.00*	*9.50*	*.75*	*1.75*	*1.75*	*17.69*
1878	4.18	.....	.....	.. ....	.....	.....	12..76	12 76
	.....	.....	....	.....	.... ..	.....	*12.00*	*12.00*
1781	14.91	11.39	3 52	14.91	3.66	.....	.....	16 05
1854	14 40	12 64	3.27	15 91	1 61	.....	.....	17.17
1855	15.13	10 93	3 23	14.16	4 55	.....	.....	15 25
2109	13 68	9.59	3.71	13 30	5 21	.....	.....	14.26
2110	15.32	10 32	4.02	14 34	3.02	.... .	.....	15.37
2111	13.53	9.11	3 91	13 02	6 04	.....	.....	13 93
2112	14 35	11.14	5 19	16 33	2 09	.... ..	.....	17.44
2113	14 26	9.29	5 32	14.61	3 16	.... ..	.....	15.54
	14.45	**10.55**	**4.02**	**14 57**	**3 67**	.. ....	.....	**15.63**
	....	*10.00*	*2.00*	*12.00*	*1.00*	..	.....	*13.00*
1782	10 79	7.88	3 52	11.40	3.67	1 97	2.19	20.78
1816	11 15	7.91	3.04	10.95	3 54	1.91	2 04	19.99
1820	10.93	7.98	3 33	11 31	4 39	1.80	2 02	19.98
1849	11.11	8.66	2 81	11.47	4 22	1 82	2 58	20.83
1928	10.61	4 35	4.27	8.62	7 29	1 99	1.99	17.51
1929	10 85	4.73	4 47	9 20	6 47	1.89	2.12	17.93
1930	10.64	5.27	4 55	9 82	6.52	1.69	2 36	18.20
1949	9.50	4.40	4 21	8 61	7 70	2 03	1.96	17.61
1969	11.65	5.44	3.92	9.36	6 56	1.70	2.14	17.57
2118	11.10	4.86	4 60	9.46	6 47	1.62	1.77	16 98

Laboratory Num'r.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2119	Mobile Standard Guano ..	Miss. and Ala. Co-op. Co , State Line
2120	"	D. L. O'Neal, McHenry .....
2121	"	J. R. Dabbs & Bro., Guntown.....
2122	"	Gilmore & May, Amory .....
2123	"	A. Roberts & Co., Lauderdale.....
		Average ....
		Guarantee.....
1943	Mobile Double Eagle	J. P. & W. C. Wetherbee, Waynesb.
1971	"	Dr. C. C. Ewing, Aberdeen .....
2061	"	J. P. & W. C. Wetherbee, Waynesb.
2062	"	L. H. Tubb, Amory .....
2116	"	J. L. McLain & Co., State Line ....
		Average ....
		Guarantee.....
1970	Mobile Dis. Bone and Pot.	T. L. Shots, Amory ....
		Guarantee.....
2114	Eclipse Soluble Guano....	A. B. Williamson & Co., Buckatunna
2115	"	R. W. Fagan & Co., Waynesboro ..
		Average ....
		Guarantee.....
2117	Genuine German Kainit..	Winner & Meyer, Meridian .....
		Guarantee.....
	NEW ORLEANS ACID AND FERTILIZER CO. New Orleans, La	
1810	Black Diamond Acid Phos	S. Cohn & Sons, Magnolia.....
1807	"	D. Rosenbaum's Sons, Meridian ....
1874	"	Hawkins & Co., Hattiesburg.....
2152	"	R. W. Carter, Iuka .....
2153	"	S. Cohn & Sons, Magnolia.....
2154	"	J. S. Weems, Shubuta ... .
2155	"	Seward & Gaston, Ackerman .... ..
2156	"	Robinson Merc'tile Co., Centreville.
		Average.... ....
		Guarantee.....
1765	Goldsmith's Imp. Mixture	Louis Cohn & Bros., Brookhaven ..
1812	"	S. Cohn & Sons, Magnolia.....
1817	"	D. Rosenbaum's Sons, Meridian ....
1841	"	Wilkinson & Rawls, Poplarville....
1840	"	Hawkins & Co., Hattiesburg.....
1936	"	Seward & Gaston, Ackerman ....
1937	"	Robinson Merca'tile Co., Centreville
1947	"	Eastabutchie Lum. Co., Eastabutchie
1962	"	Sones & Dansby, Forest.....
1963	"	The J. P. Myer Mer. Co., Taylorsv.
2011	"	Sessions Bros., Woodville .....

Laboratory Num'r.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per c'nt	Potash—Per cent.	Relative Value per ton
		Water—soluble.	Citrate—soluble.	Available.	Insoluble.			
2119	12.92	6.79	3.12	9.91	3.21	1.79	1 96	18 37
2120	13 07	7.48	2.44	9.92	1.22	1.84	2.24	18.89
2121	10.93	4.30	4.12	8.42	5.60	1.95	2.24	17.43
2122	10.85	4.29	4.93	9.22	6.52	1 85	1.69	17.35
2123	10.71	4.85	4.74	9.59	6 52	1.76	1.92	17.72
	11.12	**5.95**	**3.87**	**9 82**	**5.33**	**1.84**	**2.08**	**18.48**
	....	*6.00*	*2.00*	*8.00*	*1 50*	*1 65*	*2.00*	*15.96*
1943	13 54	12.46	.06	12.52	1.01	1 86	2 33	22.14
1971	15.03	9.52	1.55	11.07	1.56	1.34	2.29	18.67
2061	13.12	7.59	3.34	10.93	5.12	1.41	1.88	18.15
2062	13 44	7.64	2.98	10.62	1.80	1.88	1.96	19.45
2116	10 75	8.29	3.44	11.73	.82	1.62	2.49	20 31
	13 17	**9 10**	**2 27**	**11 37**	**2 06**	**1 62**	**2 19**	**19.74**
	.....	*7 50*	*2.50*	*10.00*	*1.50*	*1.65*	*2.00*	*18.11*
1970	12.02	6.73	4 14	10.87	2.35	.....	2.92	14.46
	.....	*8.00*	*2.00*	*10.00*	*2.00*	.....	*2.00*	*12.80*
2114	12 06	7.05	3.98	11 03	2.62	1.72	.94	18 27
2115	15.99	7.98	2.95	10.93	1.07	1.71	1.38	18.67
	14 02	**7.51**	**3 47**	**10 98**	**1.84**	**1.72**	**1.16**	**18 47**
	.....	*7.00*	*2.00*	*9.00*	*1.50*	*1.65*	*1.00*	*16.06*
2117	2.93	.....	.....	.....	.....	.....	13 11	13 11
	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1810	18 92	6.47	4.83	11.30	2.06	.....	.....	11.95
1807	17.92	8.01	4 69	12 70	1.98	.....	.....	13 50
1874	15.94	7.91	3.65	11.56	2.44	.....	.....	12.35
2152	15.70	10.32	4.67	14.99	2.61	.....	.....	16.02
2153	16 62	9.27	5.48	14.75	2.19	.....	.....	15 68
2154	18.38	9.07	5.24	14.31	1 91	.....	.....	15.22
2155	17.51	8.21	4.79	13.00	2.39	.....	.....	13.82
2156	12.99	10.62	5.34	15.96	2 03	.....	.....	17 02
	16.75	**8.73**	**4 84**	**13.57**	**2 20**	.....	.....	**14.44**
	.....	*10.00*	*2 00*	*12.00*	*2.00*	.....	.....	*12.00*
1765	10.71	6.75	2.73	9.48	1.97	1.60	1.27	16.63
1812	11.79	6.75	2.53	9.28	2.62	2.09	1 89	18.64
1817	12.59	6.88	3.08	9.96	2.33	1.89	1.75	18.54
1841	14.13	8.52	1.93	10.45	2 34	1.88	1.71	19.12
1840	9.45	5.74	2.84	8.58	1.98	2 07	2.08	17.96
1936	12.21	7 37	2.28	9.65	1.93	1.97	2.25	19.04
1937	11.21	7 27	2.06	9.33	3.07	1.97	1.62	18 08
1947	11.50	8.38	2.58	10.96	2.32	1.80	1.77	19.42
1962	11.58	7.71	2.65	10.36	2.64	1.95	1.70	19.17
1963	12.24	7.11	2.01	9.12	2.65	2.06	1.87	18.40
2011	12.53	7.85	2.91	10.76	2.62	2.00	1.75	19.80

Laboratory Num'r.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2157	Goldsmith's Imp. Mixture	W. M. McGough & Son, Morton....
2158	"	Pickering & Co., Mount Olive.....
2159	"	J P. Wise & Co., Hazlehurst .....
2160	"	Hyman Mercantile Co., Summit....
2161	"	J. & B. McClenahan, Pelahatchie ..
2162	"	Atkinson & Bacot Co., Osyka .....
2163	"	W H. Chambliss, Newton.....
2164	"	W. M. Hyde, Vossburg..... ....
2165	"	Bonner Bros., Sandersville .....
		Average ....
		Guarantee .....
1811	Dissolved Bone	S. Cohn & Sons, Magnolia.....
		Guarantee ....
1966	Crescent City Acid Phos.	W. H. Chambliss & Son, Newton ...
		Guarantee .....
1870	Good Luck.....	Rawls & Binns, Seminary.....
		Guarantee .....
1872	Dissolved Bone and Potash	Pickering & Co , Mount Olive.....
2009	"	Louis Cohn & Bro., Brookhaven....
2148	"	Lann & Carter, Aberdeen.....
2149	"	Louis Bendat, McComb City.....
		Average ....
		Guarantee .....
1873	Blood, Bone and Potash..	S. Cohn & Sons, Magnolia.....
1965	"	R. W. Carter, Iuka ....
2028	"	J. J. Dickson, McHenry.....
2147	"	J. P. Myer, Ellisville .....
		Average ....
		Guarantee .....
1938	Blood, Bone and Beef	Atkinson & Bacot Co., Osyka .....
2022	"	J. L. Moyse & Bro., Summit.....
2038	"	" "
		Average ....
		Guarantee .....
1871	Gold Dust.....	Rawls & Binns, Seminary .....
1964	"	J. S. Eaton & Bro., Taylorsville....
2006	"	T. L. Cotten & Co., Summit .....
2027	"	T. C. Ruble, McHenry ....
2150	"	Rew & McClinton, Newton ....
2151	"	D. H. Jones, Terry ....
		Average ....
		Guarantee .....
	STANDARD GUANO AND CHEM. M'F'G. CO. New Orleans, La.	
1784	Stern's Acid Phosphate...	Kelly & McKinnon, Seminary....

Laboratory Num'r.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per c'nt.	Potash—Per cent.	Relative Value per ton.
		Water—soluble.	Citrate—soluble.	Available.	Insoluble.			
2157	12.24	7.56	2.41	9.97	2.82	1 98	.94	18.11
2158	12.67	7.25	3 40	10 65	1.77	2.02	1.60	19.54
2159	12.64	8 44	3 28	11 72	3.16	1.92	1 60	20.40
2160	12.66	6.41	3.22	9.63	2.29	1.92	1.76	18.27
2161	10.10	7.15	3.25	10 40	3 10	1.67	1.78	18.33
2162	13.15	6.79	2 76	9 55	2.49	1.84	1 60	17.81
2163	11.84	7 71	2.31	10.02	2.88	1.87	1.57	18.44
2164	12 97	6.93	2 73	9.66	2.74	1.67	1.80	17.58
2165	12.62	7.27	2.14	9 41	2 55	1.76	1.66	17.52
	12.04	**7 29**	**2.66**	**9.95**	**2 51**	**1 90**	**1.70**	**18.54**
	.....	*7.00*	*2.00*	*9.00*	*2 00*	*1.65*	*1.00*	*16.06*
1811	13 22	11.03	4 87	15 90	2.48	.....	.....	17.00
	.....	*12.00*	*3 00*	*15.00*	*2.00*	.....	.....	*16.20*
1966	14 08	12.06	3 23	15 29	3 15	.....	.....	16.50
	.....	*10.00*	*2.00*	*12 00*	*2 00*	.....	.....	*13.00*
1870	9.87	5 67	3.56	9.23	5.30	1 80	1.18	16.83
	.....	*7 00*	*2.00*	*9.00*	*2.00*	*1.65*	*1 00*	*16.06*
1879	11 67	7 88	4.30	12.18	2.41	.....	2.25	15.22
2009	13 02	11.58	4 07	15 65	2.28	.....	2.14	18.95
2148	15 24	11.01	3.76	14.77	2.90	.....	2.23	18.10
2149	14.55	10.43	4 35	14.78	2 41	.....	3.43	19.25
	13 62	**10 23**	**4 12**	**14 35**	**2 50**	.....	**2 51**	**17 88**
	.....	*8.00*	*2 00*	*10.00*	*2 00*	.....	*2.00*	*12.80*
1873	8 67	6.05	3 30	9.35	5.46	1.65	1.17	16.49
1965	9 96	6 10	3 98	10.08	4 40	1 69	1.23	17.41
2028	3 92	5.18	2.83	8 01	7.01	2.45	1.06	17.55
2147	15 57	8.79	1 49	10 28	3.53	1.92	1.04	18.44
	9.53	**6 53**	**2 90**	**9 43**	**5.10**	**1 93**	**1.13**	**17 47**
	.....	*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
1938	11 50	4 91	2 93	7.84	5.94	1 80	1.26	15 44
2022	16.09	4 67	2.93	7.60	1.93	1 86	1.43	15.54
2038	14 09	4 44	3 56	8 00	1.87	1.98	1.45	16 33
	13.89	**4 67**	**3 14**	**7 81**	**3 25**	**1.88**	**1 38**	**15 77**
	.....	*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
1871	15 09	8 49	2.14	10.63	2.62	1.60	1.86	18.54
1964	13.24	7.14	2 75	9 89	2.62	1.99	1.70	18.77
2006	12.50	9 19	3.31	12 50	3.06	1.81	1.99	21.29
2027	12 90	7.65	3 01	10 66	2.11	1.89	1.64	19.20
2150	11.89	5.82	3 27	9.09	.74	1.54	2.07	16 75
2151	13.55	6.98	2 24	9.22	2.30	1.96	1.74	18 03
	13.20	**7 54**	**2.79**	**10 33**	**2 24**	**1 80**	**1.83**	**18.76**
	.....	*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
1784	13.72	12 20	5 11	17.31	1.11	.....	.....	18.53

Laboratory Num'r.	Name of Brand and Manufacturer.	Where and From Whom Collected.
1821	Stern's Acid Phosphate ..	W. J. Hubbard, Shuqualak .....
1858	"	W. M. Hyde & Co., Poplarville ....
1968	"	Taylor Bros. & Nelson, Magee.....
2175	"	Griffith Parkman Co., Mount Olive.
2176	"	G. H. Beeman, Harperville..... ..
2177	"	J. K. Kirkland, Quitman ....
2178	"	W. I. Heidelberg, Heidelberg.....
2179	"	W. L. Bourland, Amory..... ....
2180	"	I. H. Brown, Hickory .....
		Average ....
		Guarantee .....
1775	Stern's Amm'd R.B Sup'r's	I. N. Varnado, Osyka .....
1776	"	I. M. Eagan, Crystal Springs .... ..
1783	"	Kelly & McKinnon, Seminary.....
1856	"	Griffith Parkman Co., Mount Olive.
1836	"	H. A. Barnes, Columbia.....
1952	"	J. A. Spann, Pelahatchie ....
2024	"	H. H. Overstreet, Eastabutchie ....
2026	"	Kennedy & Co., Wiggins ....
2181	"	Hyman Mercantile Co., Summit...
2182	"	The R. W. Hinton Co., Lumberton.
2183	"	Ainsworth & Mayfield Co., Taylorsv.
2184	"	N. R. Hosey & Co., Soso.....
2185	"	I. W. Lampton & Bros., Columbia..
2186	"	James O'Connell. Purvis..... .... ..
2187	"	R. F. Everett, Braxton ....
2188	"	Hattiesburg Compress Co., Ha'burg
2189	"	McLain Bros. & Jacobs, Gloster....
2190	"	W. C. Ellis, Steen's Creek .....
2191	"	W. M. Hyde & Co., Poplarville.....
2192	"	Lampton Mercantile Co., Magnolia.
2193	"	B. Shia & Co., Collins..... .....
2194	"	Perkins & Co., Brooklyn .....
2195	"	R. T. Scherck, Brookhaven .....
2196	"	Johnson Hand Co., Ellisville.....
2197	"	Simpson Mercantile Co., Terry .....
		Average..... ....
		Guarantee.....
1769	St'd Blood Bone and Meat	I. N. Varnado. Osyka.....
1786	"	B. Shia & Co., Collins.....
1837	"	I. W. Lampton & Bro., Columbia...
1839	"	Barney Johns & Co., Gloster.....
1853	"	L. C. Smith, Lauderdale.....
2171	"	W. L. Bourland, Amory.....
		Average ....
		Guarantee .....

Laboratory Num'r.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per c'nt	Potash Per cent.	Relative Value per ton.
		Water—soluble.	Citrate—soluble.	Available.	Insoluble.			
1821	13 52	12 92	4.82	17.74	1.43	.....	.....	19.03
1858	12 05	10 49	6 09	16 58	2 69	.....	.....	17.63
1968	13.94	11.55	5 48	17.03	1.15	.....	.....	18.19
2175	12.46	11 10	5 81	16.91	1.07	.....	.....	18.02
2176	15.00	11.18	5.45	16.63	.52	.....	.....	17.75
2177	13 30	11.44	5.45	16.89	.99	.....	.....	18.03
2178	13.55	11 80	6.28	18 08	1.46	.....	.....	19 26
2179	14.31	11 26	6 12	17.38	1.73	.....	.....	18.51
2180	11 39	11.09	5 35	16 44	1.39	.....	.....	17.55
	13 32	**11.50**	**5 60**	**17.10**	**1 35**	.....	.....	**18 25**
	.....	*10.00*	*2 00*	*12.00*	.....	.....	.....	*13 00*
1775	12.30	7 10	3.02	10.12	2.39	1.93	1.53	18.63
1776	12.58	7.20	2.84	10.04	2.46	1 74	1.53	17.95
1783	11 94	7.04	3 04	10..08	2.75	1.64	1.62	17.73
1856	11.28	4 53	5.75	10.28	4.70	1.61	1.44	17.41
1836	12 01	7.18	3.07	10.25	4.26	1.73	1.57	18 18
1952	10.77	5.76	3 69	9 45	5 55	1.57	1.46	16.59
2024	12 00	6.13	3.84	9.97	4.81	1.86	1.49	18.12
2026	12 72	5 74	4.13	9.87	3 68	1.72	1.54	17 57
2181	11.34	5.60	4.47	10.07	3 35	1.79	1.33	17.78
2182	11.75	4.90	4 90	9 80	5 81	2.00	1 41	18 20
2183	11 29	6 13	3.74	9.87	3.47	1 76	1.57	17.77
2184	10 99	6 00	3 76	9 76	3.34	1.78	1.31	17.46
2185	10 65	5 85	4 54	10 39	4.49	1.89	1.31	18 43
2186	11.57	6.70	3 93	10 63	4 53	1.65	1.75	18.41
2187	10.21	6.50	3 94	10.44	4.43	1.62	1.48	17.84
2188	11.43	7.30	3.03	10 33	4.54	1.87	1.47	18.61
2189	10 25	6.15	3.89	10 04	4.85	1.56	2.04	17.77
2190	10 84	7.47	3.08	10 55	4.04	1.72	1.39	18.28
2191	11.70	7 13	3.21	10.34	4.84	1.82	1.44	18 41
2192	12 70	7.19	2.61	9.80	1.14	1.76	1.62	17 86
2193	10 68	5.48	4.81	10 29	4.84	2.01	1.14	18.51
2194	10.31	6.86	3.35	10.21	2.84	1..91	2.08	19..18
2195	10.00	5.39	4 78	10.17	4 32	1.81	1.54	18.13
2196	11.08	5.87	4.84	10.71	4.43	1.67	1.40	18.13
2197	11.13	6.98	3.19	10.17	4.35	1.90	1.35	18.39
	11.36	**6.33**	**3.82**	**10.15**	**4.01**	**1.77**	**1.51**	**18.06**
....	.....	*4.00*	*5.00*	*9.00*	.....	*1.65*	*1.50*	*16.26*
1769	12.10	7.34	2.01	9.35	3.77	1.84	2.08	18.14
1786	10.85	6.22	2.59	8 81	1.79	2 31	2.20	19.14
1837	11.35	6.96	2.42	9.38	4.54	1.83	1.71	17.73
1839	11.45	7.51	2.47	9.98	4.51	1.84	1.78	18.49
1953	13.63	6 28	3.38	9 66	3.24	1.63	2.16	17.75
2171	11.92	6.01	3.97	9.98	4.04	1.52	1.77	17.29
	11.88	**6.72**	**2.81**	**9.53**	**3.65**	**1.83**	**1.95**	**18 09**
	.....	*4.00*	*4.25*	*8.25*	.....	*1.70*	*2.00*	*16.18*

Laboratory Num'r.	Name of Brand and Manufacturer.	Where and From Whom Collected.
1785	Mississippi Home Guano..	Kelly & McKinnon, Seminary .....
1857	"	I. W. Lampton & Bro., Columbia...
1967	"	L H. Tubb, Amory.....
2172	"	Gayden & Co., Brandon .....
2173	"	Johnson Woodward Co., Mt Olive..
2174	"	B F. Fridge, Ellisville.....
		Average .....
		Guarantee.....
1838	Champ Farmer's Choice..	W. Atkinson Foxworth Co., Colu'bia
1910	"	G. Lowenberg & Co., Kosciusko....
1935	"	J. P. & W. C. Weatherbee, W'boro.
2168	"	H. C. Rogers, Centreville .....
2169	"	E. Pfeifer, Brookhaven.....
2170	"	J H. DuBose & Co., Buckatunna....
		Average .....
		Guarantee.. .....
1777	Ground Bone..	I. M. Eagan, Crystal Springs . .....
1859	"	H. A. Barnes, Columbia.....
2167	"	Collins Bros., Tylertown.....
		Average.....
		Guarantee .. ..
1946	Pelican R B. Guana.....	Wm. Atkinson Foxworth Co., Columbia .....
2166	"	Atkinson & Bacot Co., Osyka.....
		Average.....
		Guarantee .....
2032	Kainit.....	C. Atkinson Son's Co., Summit.....
		Guarantee . .....
	SWIFT FERT'ZER WORKS. Atlanta, Ga.	
1865	Golden Harvest Standard Grade Guano	M. D. Graham & Co., Forest.....
1957	Golden Harvest Standard Grade Guano.....	Wilson & Waldrop, Pelahatchie....
		Average.....
		Guarantee.. .....
2079	Special H. G. Guano.....	Sandersville Mer. Co., Sandersville.
		Guarantee .....
1909	Capital H. G. Acid Phos.	Seward & Gaston, Ackerman.....
		Guarantee... .....
1980	Swifts Plow Boy Ammoniated Bone and Potash.	J. J. Rogers, Tupelo.....
2081	Swifts Plow Boy Ammoniated Bone and Potash .	Gilmore & May, Amory ..... .
		Average .....
		Guarantee.....

Laboratory Num'r.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per c'nt.	Potash—Per cent.	Relative Value per ton.
		Water-soluble.	Citrate-soluble.	Available.	Insoluble.			
1785	9.93	6.24	2.92	9.16	.87	2 07	2 14	18.65
1857	10.06	7 14	2.65	9 79	1.61	1.75	1 95	18.14
1967	11.20	6 67	2 56	9.23	4.14	1 71	2.35	17.81
2172	10.40	6.52	2.68	9.20	1.00	1.90	2.85	18.88
2173	10 83	7.61	2.60	10.21	2.48	1.81	2.61	19.46
2174	10 74	7.10	3 15	10 25	2.47	1.88	2 09	19.16
	10 53	**6.88**	**2 76**	**9 64**	**2.09**	**1 85**	**2.33**	**18 68**
	.....	*4.00*	*5 00*	*9.00*	.....	*1.65*	*2.00*	*16.76*
1838	10.46	7.16	2.26	9.42	1.18	2.13	1.83	18.89
1910	10.14	7.14	2 02	9.16	.82	1.89	1.81	17.82
1935	11.90	6.59	3.79	10.38	.90	1.72	1.66	18 29
2168	11.21	6.29	2 66	8.95	3.51	2 07	1.63	17.94
2169	11 72	6.42	2.87	9.29	1.48	1.62	1.77	16.97
2170	10 00	6 09	2 53	8 62	4.58	1.65	1.85	16.44
	10.91	**6.61**	**2.69**	**9.30**	**2.08**	**1 85**	**1.76**	**17.73**
	.....	*4.00*	*4.00*	*8.00*	....	*1.65*	*1.50*	*15.26*
1777	6.21	....	....	.....	22.58	3.51	.....	22.70
1859	7.63	.....	.....	.....	23.23	2.56	.....	19.94
2167	6.99	.....	.....	.....	22.81	3.16	.....	21.68
	6.94	.....	.....	.....	**22.87**	**3.08**	.....	**21.44**
	.....	.....	.....	.....	*18.50*	*2.50*	.....	*17.38*
1946	14.61	4.72	3.52	8.24	4.95	1.55	1.62	15.37
2166	11.61	6.08	3.58	9.66	3.25	1.53	1.39	16.63
	13 11	**5.40**	**3.55**	**8.95**	**4.10**	**1.54**	**1.50**	**16.00**
	.....	*4.00*	*4.00*	*8.00*	*1.00*	*1 65*	*1.50*	*15.26*
2032	2.78		.....	.....	.....	.....	12.41	12.41
	.....	.....	.....	.....	.....	.....	*12.00*	*12.00*
1865	10.27	5.05	3.95	9.00	2.35	1.80	2.10	17.46
1957	9.15	5.97	2.32	8 29	3.21	1.73	2.38	16.89
	9.71	**5.51**	**3.13**	**8.64**	**2.78**	**1.77**	**2.24**	**17.18**
	.....	*6.00*	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*15.96*
2079	8.01	6.87	.87	7.74	1.83	*4.72*	3.16	26.93
	.....	*7.00*	*2.00*	*9.00*	*1.00*	*4.10*	*3.00*	*26.02*
1909	12.35	10.62	3.99	14.61	2.62	.....	.....	15.67
	.....	*10.00*	*2.00*	*12.00*	*1.00*	.....	.....	*13.00*
1980	9.78	6.84	2.76	9.60	3.99	1.22	1.48	15.73
2081	9.50	6.50	3.52	10.02	4.07	1.14	1.18	15.56
	9.64	**6.67**	**3.14**	**9.81**	**4.03**	**1.18**	**1.33**	**15.64**
	.....	*6.00*	*2.00*	*8.00*	*1.00*	*.82*	*1.00*	*12.27*

Laboratory Numb'r.	Name of Brand and Manufacturer.	Where and From Whom Collected.
1979	Swift's Wheat Growers' Acid Phos. and Potash.,	Gilmore & May, Amory
2078	Swift's Wheat Growers' Acid Phos. and Potash..	J. J. Rogers, Tupelo
		Average.
		Guarantee
2080	Swift's Cotton Plant St'd Guano	Wetherbee & Huggins, Waynesboro
		Guarantee
	TENNESSEE CHEMI'L CO Nashville, Tennessee.	
1890	Ox Slaughter House Bone	Myer & Egger, Caledonia
1813	"	W. L. Williams, Wesson.
1911	"	Potts-Jackson Co., Kosciusko
1941	"	F. M. Howard, Canton
2044	"	Potts-Jackson Co., Kosciusko
2063	"	L. H. Tubb, Amory
2096	"	L. C. Prather, Baldwyn
2097	"	Abney & Travis, Heidelberg
2098	"	Pierce, Singletary & Co., Steens Cr'k
2099	"	D. H. Ravesies, Purvis
		Average
		Guarantee
1818	Ox H. G. Dis. Bone	L. L. Anderson, Shuqualak
1869	"	W. L. Wellman, Wesson
2088	"	Dr. C. C. Ewing, Aberdeen
2089	"	W. W. Harris, Iuka
		Average
		Guarantee.
1819	Ox Acid Phosphate	L. L. Anderson, Shuqualak
1913	"	Fowler & Fowler, McCool
2090	"	D. H. Ravesies, Purvis
2091	"	F. M Howard, Canton
		Average
		Guarantee.
1868	Ox Potash Mixture	Canton Cotton Ware'he Co., Canton
1914	"	Blumenfeld & Fried, Ackerman
2094	"	S. L. Sanders, Corinth
2095	"	W. H. Barron & Co., Crystal Spr'gs
		Average
		Guarantee
1977	Ox Cotton Guano	Myer & Egger, Caledonia
2092	"	W. W. Harris, Iuka
2093	"	C. M. Elder, New Albany
		Average
		Guarantee

Laboratory Numb'r.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per cent.	Potash—Per cent.	Relative Value per ton.
		Water—soluble	Citrate—soluble	Available.	Insoluble.			
1979	9.69	6.88	3.07	9.95	4.75	.....	2.27	12 91
2078	9.60	6.78	3.69	10.47	4 50	.....	2.27	13.42
	9.65	**6.83**	**3 38**	**10.21**	**4.62**	.....	**2.27**	**13.16**
		7.00	2 00	9.00	*1.00*	.....	2.00	*11.70*
2080	9.30	6 26	2.99	9 25	3.22	1.80	1.56	*16.06*
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	1.00	17.29
1890	10 05	5.91	2.95	8 86	4.66	1.88	1.93	17.49
1813	9 68	6.08	3 19	9.27	4.48	1.27	1.80	15.81
1911	9 01	6 08	3.49	9.57	5.26	1.86	2.15	18.38
1941	9 00	6.36	3.70	10.06	3.38	1.62	2.19	18.15
2044	6.66	7.22	2 20	9.42	6.14	1.64	2.07	17.54
2063	8.25	7.33	2 49	9.82	5.72	1.55	1.95	17.54
2096	7 57	6.32	2.97	9.29	2.46	1.75	2 00	17.61
2097	9.46	5.64	3.69	9.33	4.43	1.87	2.07	18.04
2098	9.41	5.91	3.38	9.29	5.32	1.81	1.94	17.70
2099	9 05	6 51	2 96	9.47	3 08	1.58	2.08	17.34
	8 81	**6 34**	**3 10**	**9.44**	**4 49**	**1 68**	**2.02**	**17 56**
		2 00	*6 00*	*8.00*	*1 00*	*1 65*	*2.00*	*15 96*
1818	11 52	10 14	4 34	14.48	1.32	.....	.....	15.49
1869	11.79	11.62	3 30	14.92	3.17	.....	.....	16.08
2088	11.05	10 46	3.62	14.08	3.13	.....	.....	15.13
2089	9.80	9.10	5.23	14 33	1.66	.....	.....	15 24
	11.04	**10 33**	**4.12**	**14 45**	**2 32**	.....	.....	**15.48**
		12.00	*2.00*	*14.00*	*1.00*	.....	.....	*15.20*
1819	11 01	8 92	4.10	13 02	1.78	.....	.....	13.91
1913	9 52	7.61	4.51	12 12	6.78	.....	.....	12.88
2090	6.14	7.36	5.35	12.71	6.19	.....	.....	13.45
2091	8 22	7.83	5.25	13.08	4.59	.....	.....	13.86
	8 72	**7.93**	**4.80**	**12.73**	**4 83**	.....	.....	**13.52**
		10.00	*2.00*	*12.00*	*1.00*	.....	.....	*13.00*
1868	11.51	5 58	4 11	9.69	2.99	.....	2.06	12.31
1914	10.68	5.95	5.10	11.05	3 61	.....	2.44	14.09
2094	9.62	5.68	5.41	11.09	6.13	.....	2.11	13.77
2095	8.53	4 90	6 41	11.31	7.88	.....	1 55	13 35
	10 08	**5 53**	**5.26**	**10 79**	**5 15**	.....	**2 04**	**13 38**
		8 00	*2.00*	*10 00*	*1.00*	.....	*2.00*	*12.80*
1977	8.00	7 66	3.75	11.41	2.64	1 85	1.26	19.45
2092	8 80	7 57	4.11	11.68	1.01	1 59	1.37	18.98
2093	10 77	5 82	4.45	10.27	.67	1 82	1.07	17.84
	9 19	**7 02**	**4 10**	**11 12**	**1.44**	**1 75**	**1 23**	**18.75**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*1.00*	*17.16*

Laboratory Num'r.	Name of Brand and Manufacturer.	Where and From Whom Collected
1889	Ox Bone with Am. & Pot.	Dr. C. C. Ewing, Aberdeen.....
		Guarantee .....
	TENN. VALLEY FER. CO., Florence, Ala.	
1986	King Cotton Grower	Phillips, Hinds & Co., Booneville. .
		Guarantee .....
	SOLD BY THREEFOOT BROS. &. CO. Meridian, Miss.	
1779	Threefoot's H. G. Eng. Acid Phosphate.....	Threefoot Bros. & Co., Meridian....
1852	Threefoot's H. G. Eng Acid Phosphate.....	" "
2075	Threefoot's H. G. Eng. Acid Phosphate.....	J. L. Wells, Hickory .....
		Average ....
		Guarantee. .....
1780	Prolific Acid Phosphate..	Threefoot Bros. & Co., Meridian....
1851	"	" "
1939	"	" "
2073	"	M. J. L Hoye's Son, Newton.....
2074	"	W. L. Weems, Shubuta .....
		Average .....
		Guarantee ....
1778	Threefoot's Imp. Mixture.	Threefoot Bros. & Co., Meridian....
1853	"	" "
1940	"	J. M. Carter, Quitman . .....
1955	"	E. P. & B. R. Brown, Lockhart.....
2076	"	Dunigan & Whitaker, Laurel.....
2077	"	M D. Graham & Co., Forest.....
		Average .....
		Guarantee.....
	VIRGINIA-CAROLINA CHEMICAL CO. Memphis, Tenn.	
1867	Scott's H. G. Acid Phos..	Donald Bros., Magee .....
2103	"	A. Roberts & Co., Lauderdale.....
		Average .....
		Guarantee..... .....
1982	Royal Acid Phosphate....	S. M Dean, Iuka.....
2055	"	Biloxi Milling Co., Biloxi .....
		Average .....
		Guarantee .....
1866	Scott's Gossypium Phos ..	Donald Bros., Magee .....
1944	"	M. J. L. Hoye's Son, Newton .....
1983	"	R. J. Shannon, Ripley .....

Laboratory Num'r.	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per c'nt.	Potash—Per cent.	Relative Value per ton.
		Water—soluble.	Citrate—soluble.	Available.	Insoluble.			
1889	11.33	8.41	2.03	10.44	4.07	.98	1.11	15.58
	.....	*8.00*	*2.00*	*10.00*	*1.00*	*.85*	*1.00*	*14.56*
1986	11.76	5.95	2.87	8.82	3.70	1.57	1.35	15.87
	.....	.....	.....	*7.00*	.....	*1.65*	*1.00*	*13.36*
1779	14.37	11.72	4.24	15.96	.43	.....	.....	17.13
1852	13.55	13.85	2.45	16.30	.77	.....	.....	17.69
2075	12.37	13.01	2.54	15.55	.65	.....	.....	16.85
	13.43	**12.86**	**3.08**	**15.94**	**.62**	.....	.....	**17.22**
	.....	*13.00*	*2.00*	*15.00*	*2.00*	.....	.....	*16.30*
1780	13.02	12.09	3.61	15.70	.43	.....	.....	16.91
1851	11.85	7.36	5.62	12.98	1.70	.....	.....	13.72
1939	10.95	12.31	2.80	15.11	1.18	.....	.....	16.34
2073	12.28	11.74	2.15	13.89	.82	.....	.....	15.06
2074	11.23	11.77	2.20	13.97	1.82	.....	.....	15.15
	11.87	**11.05**	**3.28**	**14.33**	**1.19**	.....	.....	**15.44**
	.....	*11.00*	*2.00*	*18.00*	*2.00*	.....	.....	*14.10*
1778	13.82	6.50	3.51	10.01	.84	1.75	2.03	18.38
1853	14.62	7.50	2.07	9.57	1.00	1.80	2.22	18.39
1940	11.57	6.93	3.21	10.14	2.35	1.76	1.95	18.50
1955	13.29	7.51	2.83	10.34	1.11	1.82	1.76	18.77
2076	11.84	7.09	2.48	9.57	1.54	1.96	2.16	18.81
2077	11.63	7.10	2.48	9.58	2.48	1.73	1.92	17.83
	12.80	**7.11**	**2.76**	**9.87**	**1.55**	**1.80**	**2.01**	**18.45**
	.....	*7.25*	*2.25*	*9.50*	*1.00*	*1.75*	*1.75*	*17.66*
1867	10.49	11.63	3.42	15.05	5.21	.....	.....	16.21
2103	12.52	10.35	2.36	13.71	1.82	.....	.....	14.75
	11.50	**10.99**	**3.39**	**14.38**	**3.51**	.....	.....	**15.48**
	.....	*12.00*	*2.00*	*14.00*	*2.00*	.....	.....	*15.20*
1982	11.62	11.58	1.88	13.46	3.07	.....	.....	14.62
2055	8.59	12.64	2.36	15.00	1.84	.....	.....	16.26
	10.10	**12.11**	**2.12**	**14.23**	**2.45**	.....	.....	**15.44**
	.....	*10.00*	*2.00*	*12.00*	*2.00*	.....	.....	*13.00*
1866	11.45	7.93	2.50	10.43	5.23	1.81	2.14	19.25
1944	11.45	9.02	2.09	11.11	1.55	1.76	2.22	19.95
1983	12.24	9.21	2.98	12.19	1.84	1.62	2.15	20.53

Laboratory Num'r.	Name of Brand and Manufacturer.	Where and From Whom Collected.
1992	Scott's Gossypium Phos ..	Irving & Torbert, Wiers.....
2056	"	Biloxi Milling Co., Biloxi .....
2104	"	A E. Dalrymple, Amory .....
2105	"	Lann & Carter, Aberdeen .....
2106	"	O. Hopkins, Hickory .....
2107	"	M. D. Graham & Co., Forest.....
2108	"	Wm. Atkinson & McDonald, Wesson
		Average .....
		Guarantee.....
1895	Scott's Ammoniated Bone	W. J. Hubbard, Shuqualak.....
2100	"	C. A. Cranford, Seminary.....
2101	"	J. E. Byrd, Mt. Olive.....
		Average .....
		Guarantee.....
1981	Royal Cotton Boll Guano..	Viverett & Dear, Newton.....
2000	"	Parsons, Moreton, Wentworth Co., Brookhaven .....
		Average.....
		Guarantee.....
2025	Royal Animal Bone Guano	Batson Barnes Co., Columbia.....
		Guarantee.....
1997	Scott's State Stand. Guano	E. M. Carter, Centreville.....
2007	"	J. E. Cobb & Son, Wiers.....
		Average.....
		Guarantee.....
1999	Royal Blood and Bone....	Hyman Mercantile Co., Summit...
		Guarantee.....
2065	Scott's Potasso Phospho..	D. D. Richardson, Columbus.....
2102	"	J. J. Rogers, Tupelo .. ..
		Average .....
		Guarantee.....
2029	Scott's Meal Formula.....	N. P. Welborn & Co., Laurel.....
		Guarantee.....
2036	Kainit.....	Hyman Mercantile Co., Summit....
		Guarantee.....

Laboratory Num'r	Moisture—Per cent.	Phosphoric Acid—Per Cent.				Nitrogen—Per c'nt.	Potash—Per cent.	Relative Value per ton.
		Water—soluble.	Citrate—soluble.	Available.	Insoluble.			
1992	12.66	8.78	1.89	10.67	1.65	1.88	2.28	19.94
2056	9.56	8.01	2.01	10.02	2.11	1.96	2.53	19.72
2104	10.59	7.96	2 61	10.57	1.73	2.06	2.21	20.27
2105	12.70	8.94	2.16	11.10	1.56	1.80	2.07	19.91
2106	10.55	6.83	4.51	11.34	3.94	1.54	2.08	19.11
2107	13.82	9.97	1.57	11.54	.99	1.72	2.66	20.79
2108	11.44	6.27	4.78	11.05	3.45	1.71	2.25	19.49
	11 64	**8.29**	**2.71**	**11.00**	**2.40**	**1.79**	**2.26**	**19.90**
	.....	*7.00*	*3.00*	*10.00*	*2.00*	*1.65*	*2.00*	*18.06*
1895	10.03	8.56	1.93	10 49	1.36	1.83	1.53	18.81
2100	10.50	5.50	4.65	10.15	2 30	1 48	1.32	16.83
2101	13.24	7.50	2.64	10.14	.83	1.94	1.30	18.50
	11 26	**7.19**	**3.07**	**10.26**	**1.50**	**1.75**	**1.38**	**18.05**
	.....	*6.00*	*3.00*	*9.00*	*2 00*	*1.65*	*1.00*	*15.96*
1981	9.33	4.39	3.57	7.96	3.01	1.94	2.07	16.77
2000	9.18	5.85	3 14	8.99	2.89	1.71	2.23	17.37
	9.26	**5.12**	**3 35**	**8.47**	**2.95**	**1.83**	**2 15**	**17.07**
	.....	*7 00*	*1.00*	*8.00*	*2.00*	*1.65*	*2 00*	*16 06*
2025	18.48	7.00	2.50	9 50	2.39	1.42	1.03	15.85
		6 00	*3 00*	*9.00*	*2 00*	*1.65*	*1.00*	*15.96*
1997	10.42	5.86	2.92	8.78	1.24	1.96	2.43	18.17
2007	7 68	3.53	5.16	8 69	2.09	1.82	2.23	17.18
	9.05	**4.70**	**4 04**	**8.74**	**1.66**	**1.89**	**2.33**	**17.68**
		7.00	*1.00*	*8.00*	*2.00*	*1.65*	*2.00*	*16.06*
1999	10.74	6.08	4.88	10 96	3.28	.89	1.29	15.75
	.....	*8 00*	*2.00*	*10.00*	*2.00*	*.82*	*1.00*	*14.47*
2065	15.22	9.98	2.02	12.00	1.85	.....	2.42	15.42
2102	13.56	10 50	1.54	12.04	2 46	.....	2.51	15.60
	14 39	**10.24**	**1.78**	**12.02**	**2.15**	.....	**2.47**	**15.51**
	....	*10.00*	*2.00*	*12.00*	*2.00*	.....	*2.00*	*15.00*
2029	10.06	5.58	5.24	10.82	2.60	.97	1.07	15.60
	.....	*8.00*	*2.00*	*10.00*	*2.00*	*.82*	*1.00*	*14.47*
2036	4.41	.....	.....	.....	.....	.....	11.86	11 86
	.....	.....	.....	.....	.....	.....	*10.00*	*10.00*

ANALYSES

—OF—

FERTILIZERS

ON SALE IN MISSISSIPPI.

FIFTH EDITION,

INCLUDING ALL ANALYSES MADE DURING

SEASON 1900-1901.

These bulletins will be sent free to any address upon application to State Chemist, Agricultural College, Mississippi.

Mississippi Agricultural Experiment Station.

BULLETIN No. 69.

TEXAS FEVER.

By J. C. ROBERT.

Vaccinating a Northern Aberdeen Angus Cow (No. 49) Against Texas Fever at the Mississippi Experiment Station.

AGRICULTURAL COLLEGE, MISS.,

NOVEMBER, 1901.

MISSISSIPPI STATIONERY CO., YAZOO CITY.

TEXAS FEVER.

The importance of preventing Texas fever and of successfully treatiug it, where it may exist, has been sufficiently great to warrant the expenditure of considerable money and much time and energy in studying the disease. The well known fatality ordinarily accompaning the introduction of cattle from above what is called the "Texas fever line" into our state has largely prevented attempts to bring into our borders the costly animals of the finer breeds; and the frequent occurence of the disease among our native cattle has been a source of great loss to many of our stock-men. To discover means of obviating this fatality has been our endeavor in the experiments undertaken. But in a popular bulletin of this sort the details of all experiments will not be given, as farmers, usually, do not want details but only such conclusions as have direct bearing on their affairs.

Cattle vaccinated.—During the last two years we have vaccinated sixty-five (65) northern cattle against Texas fever. Eighteen of these were purchased by the Station for this experiment, the remaining forty-seven belonged to private individuals. Thirteen of the eighteen Station cattle were from one to eight years old when vaccinated; five, from two to ten months old. Sixteen of these eighteen lived through the vaccination, have all had ticks on them, and are now doing well. The remaining two (Nos. 52 and 60, that we refer to later) were vaccinated with blood from a calf just recovering from Texas fever.

Of the forty-seven remaining cattle, forty-four were 18 months old and under when vaccinated; three were cows from 4 to 7 years of age. Twenty of them were vaccinated once only, twenty-seven were vaccinated twice. Twenty-two of the forty-seven were kept free of ticks until after the vaccination fever, and all are now carrying ticks and doing well. None died. Twenty-five were subjected to tick infestion before they recovered from the vaccination fever and three died. Two of these were calves about 7 months old and one a cow about five years old. Ticks were found on the cow and on one of the

dead calves, hence we attribute death of all three to premature tick infestion. It is possible that one of the calves died as a result of the second vaccination, as we found no ticks on it.

Nature of Texas fever.—Texas fever is an infectious blood disease of cattle caused by the growth and activity of a microscopic animal parasite within the red blood cells. This germ is known as the *pyrosoma bigeminum:* it breaks down the red blood cells of the infected animal and produces a type of fever similar in many respects to malarial fever in man. Each is due to the activity of an animal micro-parasite. In malaria the microbe may be carried from a person having the malarial plasmodium in his system to a healthy man by the intervention of the mosquito; in Texas fever the animal microbe is carried from the infected cow to the uninfected animal by the common cow tick. In each disease there is high fever, great depression, rapid loss of red blood cells, and often red or black colored urine caused by the escape of coloring matter from disentegrated red blood cells. This has given rise to the names "red water," "bloody murrain," etc., which are sometimes applied to Texas fever.

Records and Symptoms.—In mild attacks, such as usually occur in our southern calves during their first spring and summer, the symptoms usually escape our observation, as a decrease in the number of red blood cells alone, occurs without any noticeable fever. We cite as an example No. 75, a native Jersey calf, kept on tick-free pasture until five months old. At that time, February 19th, 1901, we vaccinated him with 2.5 cubic centimeters of warm blood taken from a tick-infested native cow. At 8 A. M. on February 27th his temperature was 103.1 degrees F. At 3 P. M. the same day it was 105.3 and the red blood cells numbered 7,020,000 per cubic millimeter of blood. His temperature was taken once or twice daily and showed his fever gradually declining. On March 4th 4 P. M. temperature 104.8 red blood cells 4,540,000 per cubic millimeter; March 9th red blood cells 3,990,000, temperature 103.4. The red blood cells now increased rapidly; and on March 27th they were 9,950,000. During this entire time but for the use of the thermometer or the instrument used for counting the red blood cells we could not have told that the calf was sick.

In more severe cases, as seen in some calves and in cattle that reach the age of 12 months or more before they come in contact with the cow tick, the symptoms are more prominent. Let us take for instance No. 68 of our experiment, a grade Angus calf seven months

old. This calf was dropped December 1st, 1900. He was kept at night in a small inclosure that, so far as we could tell, was free of ticks. During the day he was kept on a pasture upon which we found none of these parasites. About June 15th he was placed in a large pasture with a number of ticky cattle. On June 28th he was found down in the pasture with high fever and rapid respiration, and had on his body numerous small ticks. He had lost some flesh, had grown quite weak and would rise only when made to do so. The owner gave him a dose of salts, scraped off all the ticks that he could, and then oiled him and left him in the pasture. I first saw the calf on June 30th at which time he was lying down. He had lost flesh and was quite weak; his temperature had been reduced to normal but his pulse and respiration were rapid. Upon counting his red blood cells I found that they had been reduced from the normal (which I find in a calf of his age to be about 7,000,000 per cubic millimeter of blood) to 2,470,000 per cubic millimeter. Thus we see that he had lost about five-sevenths of his blood corpuscles and was necessarily very much wenkened. On July 6th his blood cells were 2,940,000, his temperature registered 105.7 and he was quite thin. I did not see him after this time but he continued to grow worse, he got down, was unable to rise, and the owner had him killed on July 15th. The owner did nothing for him after the second day, as the pasture was some distance from the house and he had neither time nor inclination to carry out the prescribed treatment.

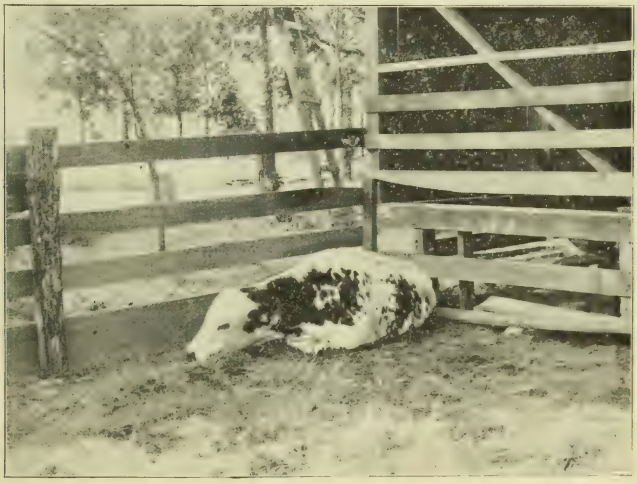
To briefly sum up the history of one of our northern cows which we vaccinated, we mention (No. 56) a high grade Red Polled cow, eight years old, weighing eight hundred and sixty (860) pounds. This cow, with a lot of others, I brought from Iowa and Illinois in November 1900 and kept on tick-free pasture. All of these cattle before vaccination remained free of fever just as long as we kept them free of ticks. On February 27th her red blood cells numbered 5,020,000 per cubic millimeter. On March 14th she was vaccinated with twenty-five (25) cubic centimeters of warm blood from a tick-infested southern cow. On March 22d 8 A. M. her temperature rose to 104 degrees F. and, with the exception of one day it remained up, with some fluctuation, until March 30th, 12 M, when it returned to 101.6 degrees F. The highest temperature recorded was at 11 P. M. March 24th when it reached 108 degrees F. From our note book we take the following remarks on the case: March 22d temperature 104 to 105.4 degrees, red blood cells 5,810,000 per cubic millimeter, respiration 44 per minute, pulse rapid; March 23rd temperature 103.6 to 104.8, respiration 25 per minute; March 24th temperature 106.2

to 108, urine dark wine colored at 8 A. M., (and black at 11 P. M.,) appetite good, cow very weak, red blood cells 5,080,000 per cubic millimeter. At 10 A. M. respiration 104; March 25th temperature 105 to 106.1 urine bloody, refused to eat cotton seed meal and hulls but ate hay. Red blood cells 3,660,000 per cubic millimeter at 5 P. M.; March 26th temperature 100.8 to 102.0, urine lighter in color, red blood cells, at 4 P. M., 2,910,000 per cubic millimeter; March 27th cow weak, emaciated, temperature 102 to 102.9; March 28th, cow lying down, moaning, urine black, appetite poor, temperature 104.3 to 106.4, red blood cells 2,180,000, hæmoglobin 26% only of the normal amount; March 29th temperature 103.6 to 105, no appetite, red blood cells 2,230,000 per cubic millimeter; March 30th red blood cells 2,620,000 per cubic millimeter, urine nearly normal, temperature 101.6 to 103.3, eating hay, chewing cud; March 31st temperature 103 to 104.8; April 1st temperature 102 to 103, urine clear, red blood cells 2,860,000 per cubic millimeter; April 2nd temperature 102 to 104, red blood cells 2,840,000 per cubic millimeter; April 6th red blood cells 2,950,000, urine clear; April 8th red blood cells 3,650,000, pulse 76 per minute, respiration 38; May 15th red blood cells per cubic millimeter 4,260,000, temperature 101.2; June 28th there were 6,540,000 red blood cells per cubic millimeter, temperature 101.6; on April 1st she gave birth to a calf. At birth the calf did not have fever, but on the eighth day it developed a well marked case of Texas fever with a decrease of 2,470,000 red blood cells per cubic millimeter less than was recorded on April 2nd, with temperature 104.1; this reached 105 degrees at 8 A. M. on April 9th with pulse 150 and respiration 56 per minute. The cow and calf are both now in very good condition. By examining the above record we see that this cow lost in 33 hours (between 8 A. M. March 24th and 5 P. M. March 25th) 1,420,000 red blood cells per cubic millimeter of blood which represented more than one-fourth of (5,080,000) her red blood cells on the 24th. Within the next 23 hours she lost 750,000 per cubic millimeter.

Post-mortem appearance.—We give below from our note book record of a recent post-mortem examination we held on a Texas fever case. This animal, a full blooded Jersey heifer about 18 months old, was raised in the town of Starkville, Mississippi, and it was not known whether or not any ticks got on her the first summer. Shortly after turning her in a tick-infested pasture she was seen sick and on the next day was found dead. I held an examination probably not later than

6 or 8 hours after death and made the following observations: Heifer lying on left side. External appearance normal with many young ticks on thigh, udder and flanks. Peritoneum, pluera, lungs, and pericardium, normal. Extravasations of blood on the outer surface of both ventricles of the heart and on a portion of the endocardium. Omentum yellowish. The liver about two and a half times its normal size, edges round, yellowish, structure easily broken down. Bile duct very much distended. Gall bladder filled with gall that was thick and flaky. Spleen about two and a half or three times its normal size, with structure soft and friable. The first, second and fourth stomachs were normal, the contents of third stomach being abnormally dry. Surface of small intestine congested. Large intestine normal. Inguinal lymphatic glands congested. The urinary bladder very much distended with dark bloody urine: Kidneys inflamed, with extravasations of blood on the outer surface of the left kidney. Blood throughout entire body thin and coagulates poorly.

Texas Fever in Native Cattle.—The so-called "murrian" in cattle (consisting of loss of appetite, excessive thirst, high



Native Steer (No. 28) sick with Texas Fever.

fever, more or less constipation, bloody or wine colored urine, and great depression, followed by emaciation, weakness, and

often by death) is identical with Texas fever and very common among our native cattle. Nos. 42 and 65 of our experiments, already alluded to were native calves. The above mentioned post-mortem examination was of a native cow. In fact, scarcely a month passes during the spring and summer that we are not called upon to treat, either personally or by letter, cases of Texas fever in native cattle. In this way we have had an opportunity to study the

Native Steer (No. 44) recovering from Texas Fever.

disease from the symptoms, the microscopic examination of the blood, and by post-mortem appearances, all of which confirm the diagnosis of Texas fever.

It is a common practice among some farmers to separate the calves from the milch cows when born, to feed skim milk when a few days old, and to allow calves to run on cultivated fields (that are free

of ticks) until they are 8 to 10 months of age. Again, some are kept in lots and other tick-free inclosures as around towns until they are one and a half or two years old. Frequently negroes who own cows graze them by staking them out on cultivated fields in fence corners, and along ditches, and in this way they are kept free of ticks. The calves are kept in small lots during the day, and run in the fields at night, and are usually sold at 8 to 12 months of age. The purchaser places the yearling in his pasture with numerous others, some of which are almost sure to have ticks. The newly purchased calf becomes infected and may show symptoms of Texas fever in from 12 to 21 days, and often such a case results in death. Within the last few weeks six (6) such cases (3 of which died) have come under our observation. We are sure that the farmers of our state lose annually, by Texas fever in native cattle, many thousands of dollars, and, yet, with a proper appreciation of the nature of the disease and the method of preventing it, native cattle may be prevented from having it in serious form.

Calves a few weeks old are only slightly affected by Texas fever, but with older animals the disease goes much harder especially if they be over eighteen months old.

As additional evidence that there is no hereditary transmission of immunity to Texas fever the following records are given: A registered Jersey calf (No. 76) dropped in a tick-free pasture, and No. 75, already alluded to, were both out of native cows (Nos. 73 and 74). These cows were proved to be immune to Texas fever. They were free of ticks, however, were kept on a tick-free pasture, and their calves (Nos. 75 and 76) were allowed to suck them. On April 1st, 1901 when No. 76 was four months of age, we drew about half a pint of blood from his jugular vein, defibrinated it and with it immediately vaccinated two Northern cattle. These northern cattle were from a lot that we imported November 1900 and kept free of ticks. No. 52, a grade Hereford cow about 8 years of age, received, on April 1st, 1901, subcutaneous injection of 25 cubic centimeters of blood from No. 76. The temperature of this Hereford cow was taken daily for more than a month but she did not show the slightest fever. On the same day, April 1st, we vaccinated No. 60, a grade Hereford northern calf about six months old, with 10 cubic centimeters of blood from No. 76. The temperature of this calf, like that of No. 52, was recorded daily for about five weeks but no fever developed. The red blood cells of these cattle remained normal through this period. On April 15th the red blood cells of No. 52

were 7,790,000; On April 29th, 6,430,000; on May 3rd they numbered 7,430,000; On April 17th the red blood cells of No. 60 numbered 9,470,000; On April 29th they numbered 8,780,000; and on May 3rd 9,260,000. We thus see that neither of these northern cattle contracted Texas fever from this vaccination, which fact proves the non-existence of the Texas fever germ in this calf No. 76. On April 15th we vaccinated this calf with 2.5 cubic centimeter of defibrinated blood taken from No. 61 (a full blooded Angus heifer that we brought south in November and rendered immune to Texas fever by vaccination). On April 16th No. 76 showed by the hæmatocytometer 9,830,000 red blood cells, and at 9 A. M. had a temperature of 101.9 degrees F. The first rise of temperature occured on April 22nd when lt reached 102.7 degrees; on the 24th at 9 A. M. it was 104 degrees and his red blood cells numbered 5,710,000; on the 25th his temperature registered 104.8; on the 26th 105.5; on the 27th 103.4; on the 29th 102.2; and on May 3rd 101.7 with red blood cells numbering 5,700,000, which is more than 4,000,000 less than those recorded on April 16th.

On May 3rd 1901 we for a second time drew blood from No 76 and revaccinated Nos. 52 and 60 with 25 cubic centimeters and 10 cubic centimeters respectively of his blood, as was done on April 1st. From this vaccination we get very different results. On the day of vaccination, May 3rd, No. 52 had 7,430,000 red blood cells and at 12 M. her temperature registered 101.8 degrees. At 4 P. M. on the 6th, three days after vaccinating we turned this cow with No. 60 and several others into a larger and better pasture, one that had been occupied by native cattle. At 9 A. M. on the 8th, five days after making the vaccination her temperature was 102. At 6 P. M. on the 9th it rose to 105.4 and remained high until death which occured the night of the 15th, twelve days after the vaccination. On the day before her death the red blood cells numbered 2,600,000 and temperature was 106.2 degrees F. at 8 A. M. On the day of revaccination, May 3rd, the blood cells of No. 60 numbered 9,260,000. On May 10th, 9 A. M., just seven days after vaccination, her fever rose to 102.9 degrees; on 12th 8 A. M. temperature 103.0; 13th 103.8; 14th 103.6 and red blood cells 7,930,000; 15th 104.0; 18th 106.6 and red blood cells 4,680,000; on the 19th 106.2. She now began to improve but became infested with ticks before she had recovered, hence, a relapse which rasulted in death on June 30th. On May 23rd her red blood cells numbered 6,970,000; May 29th 7,660,000, temperature 107.6 degrees, and one tick three weeks old and one about ten days

old found on flank and thigh; on June 30th, a few hours before death, the red blood cells numbered 4,340,000 and temperature 104.6. Other cases of Texas fever in southern cattle that have come under our personal observation are Nos. 39 and 40, native milch cows on the same pasture which become infested with a large number of ticks, developed a typical case of the disease, and died after a few days sickness. Post-mortem examination of these cases showed the characteristic lesions of Texas fever. No 29, an eighteen months old heifer, and No. 42, a young cow, both in the same pasture, died the same evening. We held autopsies the following morning, which confirmed our diagnosis. Among the other characteristic pathological conditions we found the urinary bladder of each of these two filled with hæmoglobic urine. Nos. 28, 40 and 44, three steers belonging to the Experiment Station, were during their first summer kept on a tick-infested pasture, but we tried to destroy ticks in pasture by oiling the cattle. During their second summer they became grossly infested with ticks, developed a serious type of the fever but recovered. No. 41 was a steer that became emaciated, with red blood cells reduced to 3,400,000 per cubic centimeter but recovered.

As evidence that under natural conditions native calves usually become artificially immune to the disease we mention No. 30, a calf of a northern cow dropped in a tick-free pasture and placed immediately upon a native cow, and Nos. 31, 32, 33, 34, 35, 36, 37 and 38, from three to six weeks old, brought from the north and placed upon native cows. These all became tick-infested without showing outward symptoms of Texas fever.

Conclusions.—From a consideratiou of the facts as ascertained from the experiments we deduce the following conclusions, viz..

(1) That immunity to Texas fever is not transmitted by heredity, but must in every case be acquired by an individual attack of the disease.

(2) That non-immune cattle of all ages are subject to it.

(3) That Southern cattle raised free of cow ticks are just as subject to Texas fever as Northern cattle, and when they come in contact with the cow-ticks they are just as apt to die of Texas fever as Northern cattle, of the same age and constitution, similarly affected.

(4) That vaccination is the most practicable method of conferring immunity so far as we now know, and it may be practiced

upon animals of any age, though it gives best results with cattle under eighteen months old.

(5) That until after the vaccination fever cattle must be kept free of cow-ticks, and during this period should have wholesome, nutritious, laxative diet and plenty of pure drinking water.

(6) That no farm south of the "Texas fever line" should be entirely freed of ticks *if the farmer expects to sell cattle to other Southern buyers.* A few cow-ticks, at least, should be kept upon every such stock farm.

(7) That every calf dropped in the south and every one brought here from north of the "Texas fever line" should as soon as practicable be brought in contact with ticks. If such calf is over six (6) months of age we would advise that he first be vaccinated.

(8) That late fall or winter is the best time to bring northern cattle South. They should be vaccinated as soon as rested from their trip.

Treatment of Texas fever.—It is very desirable that we recognize Texas fever from the onset of the disease and begin at once a careful and systematic course of treatment. In the treatment of every such case there are three objects that we should have in view; first, to prevent further infection by the immediate removal of all ticks from the body of the animal; second, to combat as far as possible the disease producing germs already in the system and counteract their effect by the administration of drugs; and, third, to nourish the animal throughout the entire course of the disease at regular stated intervals.

The removal of ticks is best accomplished by use of a stiff brush ollowed by the application of an oil to destroy all minute ticks that we have failed to see. Cotton seed oil may be used for this purpose and is best applied by means of a broom or paint brush. Oil closes the breathing pores in the skin of the tick and thus destroys them.

The medicinal treatment employed in every case that has recently come under our observation, and which we are happy to say has proven very successful consists mainly in the administration of large doses of Bisulphate of Quinine at frequent intervals until the system is well saturated with it. The similarity in nature of this disease and malarial fever led us to believe strongly in the efficiency of quinine as a curative agent in Texas fever. The plan of medicinal treatment that we have adopted in these cases has been as follows:

If necessary give from one to one and one-half pounds of Epsom Salts combined with one-quarter of a pound of ground ginger in one quart of water as a drench. Following this, administer Bisulphate of Quinine in from 60 to 120 grain doses dissolved in one-half pint of water. Give the quinine every two to four hours as long as the temperature of the animal remains above 103 degrees F., then gradually decrease the dose. Should the animal grow weak it should have combined with the quinine from one to three ounces of alcohol or twice that amount of whiskey. When improvement commences the administration of an iron tonic will be found of value. We may prepare such a tonic by the use of Powdered Sulphate of Iron 2 parts, Powdered Nux Vomica 1 part, Powdered Gentian Root 1 part, Sulphate of Soda 2 parts, and common salt 4 parts, Mix these ingredients and give to a grown animal from one to one and one-half heaping tablespoonfuls in feed twice daily.

Too much pains cannot be taken with nursing a case of Texas fever. The high fever incident to the disease rapidly exhausts the animals strength and unless the proper nourishment and care is given death may result before we look for it. Give tempting, nutritious, laxative diet and pure drinking water. If the animal refuses to eat drench every four hours with one quart of sweet milk in which has been beaten 4 or 6 raw eggs.

How to vaccinate.—The vaccination is very simple, consisting only in the transfusion of blood from a tick-infested native cow into the uninfected animal. It is not essential that the cow should have ticks on her body at the time we draw the blood, for the Texas fever germ will live for months in the blood of cattle, but we should at least be sure that the animal has been infested recently. We prefer that the cow (from which we extract the blood) show ticks, as we are then sure of the virulence of the virus. Any intelligent farmer can vaccinate his cattle if he will be careful to sterilize the utensils and instruments used.

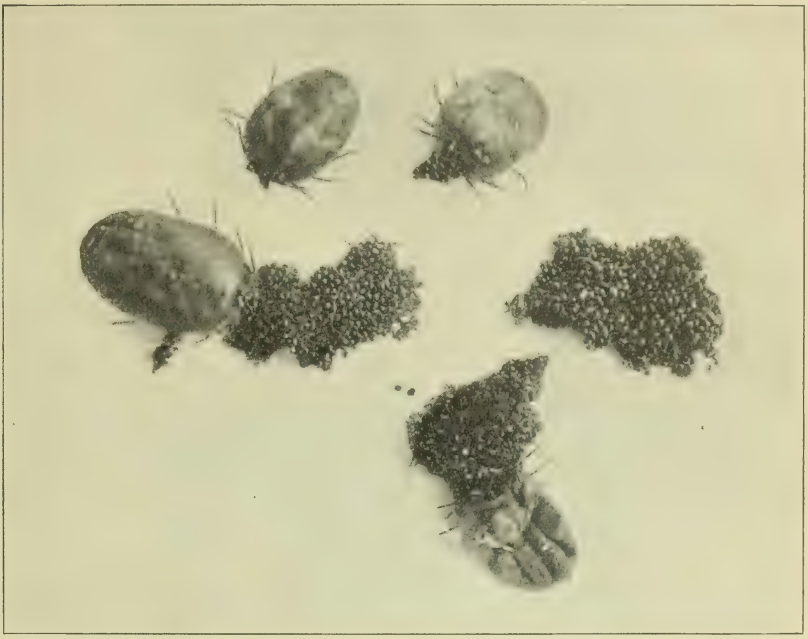
In order to make this vaccination there is needed (1) a tick-infested cow, (2) a knife with sharp blade, (or better, a fleam) to open the jugular vein, (3) a cup to catch the blood, (4) a hypodermic syringe (holding at least one-half fluid dram) with which to make the injection, (5) a pair of scissors, (6) one or two pins to close opening in jugular vein and a string to tie around same, and (7) a 3 per cent watery solution of carbolic acid. The above mentioned instruments should be sterilized by placing them in cold water and boiling for one-half hour.

Secure the cow with a long rope either fastened around the horns or made into a halter. Pass this rope around a fence post with the left side of the cow to the fence. Bring rope over right side of cow, pass the end around first post to rear of cow and give it to an assistant to hold. In this way the cow is held firmly against the fence. Tie a short rope around base of the cow's neck so as to compress and distend jugular vein. Clip hair over the vein with the scissors, wash the skin at this point with the antiseptic and have another assistant place hand over cow's eye. Open vein with fleam or knife, catch blood in cup, and with hypodermic syringe and needle inject it beneath skin of the neck of animal to be vaccinated from one-half to one fluid dram for the first injection, and one and a half to three fluid drams for the second vaccination. The point of injection should be carefully washed with some antiseptic. (see half-tone on title page). We do not think it absolutely necessary to vaccinate twice, but it is safer. We have never failed to find a decrease in number of red blood cells and sometimes a rise of temperature after the second vaccination. The second vaccination should be made about six (6) weeks after the first, provided the animal has entirely recovered from the first vaccination.

TO RENDER NATIVE CATTLE IMMUNE.

As already indicated calves during the first months of their life withstand Texas fever better than at any other time, hence every southern farmer should be *sure* that his calves get ticks upon them during their first season of ticks. To this end every farmer may keep a few of these ticks on hand constantly. This can easily be done by placing a few of the large ticks (which are females, the male tick is only about the size of a pin's head), say half a dozen, in a clean quinine bottle, close the bottle by tieing a piece of thin cloth over it. It is well to place a little dirt in bottle before putting in the ticks. In a few days these ticks begin laying eggs, as shown in illustration. Each tick lays on an average from 1200 to 3000 eggs. These eggs hatch in a few weeks in the spring, summer and fall, and produce what we usually call "seed ticks." A young calf can be killed by applying a very large number of these ticks, but we can safely place 75 or 100 on him. By placing a few ticks in a bottle every six or eight weeks we can always keep the seed ticks on hand for our young calves. This is certainly the safest plan.

In conclusion we wish to define again in full our position thus,— No man need ever fear his cattle (either southern or northern bred) will die of Texas fever if they never come in contact with the cow-



Cow Ticks (the carrier of the Texas Fever germ) laying eggs.
(One and one-half times the natural size.)

ticks (boophilus bovis), and the above recommendations relative to the use of cow-ticks or vaccination are only given because sooner or later almost all cattle below the Texas fever line must come in contact with the cow-ticks and become infected by the virus of Texas fever.

Mississippi Agricultural Experiment Station.

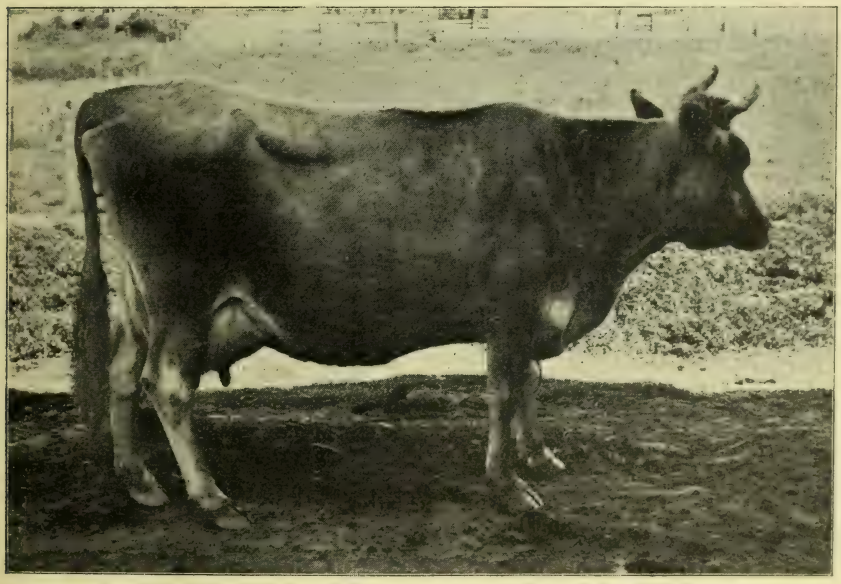
BULLETIN NO. 70.

1. RECORDS OF STATION COWS.

2. FEEDING DAIRY COWS.

BY

J. S. MOORE.



TOBIRA 2ND.

OWNED BY MISSISSIPPI EXPERIMENT STATION

AGRICULTURAL COLLEGE, MISS.,

DECEMBER, 1901.

RECORD OF STATION DAIRY COWS

FOR 1897 TO 1900, INCLUSIVE.

The Herd.—All the cows included in the following records are pure-bred Jerseys. They are of all ages, ranging from cows with their first calves to those which are now thirteen years old. The record for each year begins on January 1st. and closes December 31st. regardless of the time of calving or the length of time the cows were dry during the year.

Keeping the Records.—Except for the year 1897, when no record was kept of the amount of food eaten, a complete record has has been kept of the cost of each cow, the total yield of milk, the per cent of butter fat, etc.

Feeds.—The following table gives the values placed on the different feedstuffs given to the dairy cows during the period covered by the records. These prices are based on the market values of these feeds when purchased. The item of pasture was estimated and placed at five ($5.00) dollars for each cow.

TABLE 1.—VALUE OF FEEDSTUFFS.

FEED.	1898.	1899.	1900.
Cottonseed meal, per ton	$16 00	$16 00	$19 00
Wheat bran, per ton	16 00	16 00	18 00
Corn meal, per ton	18 00	18 00	18 00
Corn and cob meal, per ton	11 20	12 50	15 00
*Cotton seed, per ton	6 75	6 75	7 50
Cowpea hay, per ton	10 00	10 00	10 00
Johnson-grass hay, per ton	10 00	10 00	10 00
Cottonseed hulls, per ton	3 50	3 50	3 90
Corn silage, per ton	2 00	2 00	2 00

*No cotton seed were fed during the latter part of 1900, as the prices were then too high ($12.00 to $15.00 a ton) to justify their use.

Feeding.—The station herd is often used to determine the relative values of the different feeds and for this reason we can not always use the most economical ration or the one most relished by the cows. The appetites and tastes of each cow are studied and, as far as possible, those feeds are given that are the most palatable. As much of a variety is given at all times as possible, for cows, like human beings, crave variety in their food. Some crop, such as sorghum, is grown to take the place of the pasture grasses during the fall months, when, owing to the drouth

which usually occurs at that time, the pastures are very poor. A sudden change from one food to another is never made as it will in most cases cause a decrease in the flow of milk. If a change is necessary it should be gradual.

TABLE 2.—SUMMARY OF RECORD FOR 1897.

NAME OF COW.	Milk, lbs.	Butter fat, lbs.	Butter, lbs.	Value of milk at 15c a gallon.	Value of butter at 20c a pound.
Venona Pogis	3,777	203.9	237.9	$ 65.85	$ 47.58
Sallie Bud	3,838	203.4	237.3	66.90	47.46
Timola	4,818	233.2	272.1	84.00	54.42
Poga Minka	3,742	209.5	244.4	65.25	48.88
Tobira 2nd	4,041	202.0	235.7	70.50	47.14
Average	4,043	210.4	245.5	70.50	49.10

As has been noted the record for this year is very incomplete and it is only given here to show the increased yields in later years by systematic and careful feeding, coupled with care in handling and breeding. The average yield of milk was 4,043 pounds, ranging from 3,742 pounds, for Poga Minka, to 4,818 for Timola. The yield of butter ranged from 235.7 pounds to 272.1 pounds, and averaged 245.5 pounds.

TABLE 3.—SUMMARY OF RECORD FOR 1898.

NAME OF COW.	Cost of feed.	Milk, lbs.	Butter fat, lbs.	Butter, lbs.	Cost of 100 lbs. of milk.	Cost of 1 lb. of butter.	Value of milk at 15c a gal.	Value of butter at 20c a lb.
					Cents.	Cents.		
Venona Pogis	$ 27.73	5,123	272.4	317.8	54.1	8.72	$ 89.35	$ 63.56
Sallie Bud	22.86	4,972	266.0	310.3	46.0	7.37	86.71	62.06
Timola	22.25	4,836	241.0	281.0	46.0	7.92	84.34	56.20
Poga Minka	26.48	3,659	211.4	246.6	72.4	10.74	63.82	49.32
Tobira 2nd	24.43	3,795	203.0	236.8	64.4	10.31	66.19	47.36
Bessie Russell	22.19	3,562	178.3	208.0	62.3	10.67	62.10	41.60
Average	24.32	4,324	228.7	266.7	57.5	9.29	75.42	53.35

From this record it will be noticed that the cost of feed for the year ranged from $22.19, for Bessie Russell, to $27.73 for Venona Pogis, the average being $24.32. The average yield of milk was 4,324 pounds and the yield of butter ranged from 208.0 pounds to 317.8, and averaged 266.7 pounds. The cow eating the greatest quantity of feed and the cow eating the least gave re-

spectively the largest and the smallest yields of butter. The cost of feed to produce a pound of butter ranged from 7.37 cents to 10,74 cents, and averaged 9.29 cents.

TABLE 4.—SUMMARY OF RECORD FOR 1899.

NAME OF COW	Cost of Feed.	Milk, lbs.	Butter fat, lbs.	Butter, lbs.	Cost of 100 lbs. of milk.	Cost of 1 lb. of butter.	Value of milk at 15c a gal.	Value of butter at 20c a lb.
					Cents	Cents		
Venona Pogis	$30.48	6.090	353.3	412.2	50.0	7.39	$106.20	$82.44
Sallie Bud	27.00	4,224	214.7	250.5	63.9	10.78	73.65	50.10
Timola	17.33	2.631	131.4	153.3	65.9	11.30	45.90	30.66
Poga Minka	30.00	6.176	344.5	401.9	48.6	7.46	107.70	80.38
Tobira 2d	29.67	7,952	377.1	440.0	37.1	6.74	138.75	88.00
Bessie Russell	29.53	4,457	257.5	300.4	66.2	9.83	77.70	60.08
Margery K	26.27	4,346	247.5	288.7	60.4	9.10	75.75	57.74
Loui L	28.24	4,891	303.2	353.7	57.7	7.98	85.35	70.74
Average	27.31	5.096	278.6	325.1	56.2	8.82	$ 88.88	$65.02

The range for the cost of feed for this year was from $17.33 for Timola to $30.48 for Venona Pogis, and the average cost was $27.31. The average yield of milk was 5,096 pounds, ranging from 2,631 pounds to 7,952. The amount of butter ranged from 153.3 pounds to 440, and averaged 325.1 pounds. The cost of feed to produce a pound of butter ranged from 6.74 cents to 11.30 cents, and averaged 8.82 cents. The greatest cost of butter was from the cow eating the least food and next to the cheapest butter was that made from the cow consuming the largest quantity of food. In this case, however the cow giving the small yield is naturally a good cow, but was taken very sick just after calving which caused her milk yield to be greatly reduced.

TABLE 5.—SUMMARY OF RECORD FOR 1900.

NAME OF COWS.	Cost of Feed.	Milk, lbs.	Butter fat, lbs.	Butter, lbs.	Cost of 100 lbs. of milk.	Cost of 1 lb. of butter.	Value of milk at 15c a gal.	Value of butter at 20c a lb.
					Cents.	Cents.		
Venona Pogis	$34.48	5,141	265.4	309.6	67.0	11.13	$ 89.70	$61.92
Sallie Bud	34.69	5,238	241.9	282.2	66.2	12.29	91.35	56.44
Timola	36.51	7,043	373.9	436.2	51.8	8.37	122.85	87.24
Poga Minka	35.38	4,873	328.0	382.7	72.6	9.24	84.90	76.54
Tobira 2nd	30 66	5,697	273.1	318.6	53.8	9.62	99.30	63.72
Bessie Russell	32.04	3,800	229.4	267.6	84.3	11.97	66.30	53.52
Margery K	30.84	4.522	251.1	293.0	68.2	10.53	78.90	58.60
Loui L	32.61	4,902	295.2	344.4	66.5	9.47	85.50	68.88
Tobira 3rd	34.67	5,127	246.1	287.1	67.6	12.07	89.40	57.42
Average	33.54	5,149	278.2	324.6	66.4	10.52	89.80	64.92

The record of the herd for the year shows that the average cost of the feed was $33.54, ranging from $30.66 to $36.51. The yield of milk ranged from 3,800 pounds to 7,043 pounds, the average being 5,149 pounds. The average amount of butter was 324.6 pounds, and ranged from 267.6 to 436.2 pounds. The average cost of feed to produce 100 pounds of milk was 66.4 cents. The cost of producing 1 pound of butter ranged from 8.37 cents to 12.29 cents. The average being 10.52 cents.

The grain feed was much higher than on previous years and the cost of keeping the cows was therefore considerably increased. Bessie Russell failed to "catch" when bred, and at the beginning of this year had already milked ten months. Her record is therefore lower than it would have been if she had come in fresh during the year.

From the preceeding records and the practical experience obtained in the feeding of dairy cows the following conclusions may be drawn:

1. Different cows require varying amounts of feed to produce the greatest yield at the smallest cost.

2. All cows have not the same tastes, and in order to obtain the largest profit it is necessary to feed each cow such food as will be relished.

3. As much of a variety should be given as possible. Of two rations containing the same amount of digestible material that one is usually the best which is composed of the greatest number of feeds.

The same cow will not produce the same quantity of milk and butter every year, but will have her "off periods" and the feed should be regulated accordingly.

5. It may be laid down as a rule that the cow should have all the feed that she can make profitable use of.

FEEDING EXPERIMENTS.

We give below the comparative values of cottonseed meal and wheat bran and the comparative values of cowpea hay and Johnsongrass hay as indicated by results obtained during the past year.

Plan of the Experiments.—Before a trial was commenced, all of the cows were fed on the same ration and they were then divided into lots of three cows each so that the lots gave, as near as possible, equal amounts of milk. The cows were weighed for two or three consecutive days and the average taken as their true weight. Each experiment lasted four weeks, when the cows were again weighed for three consecutive days and the average taken as their true weight at the close of the trial.

Cottonseed Meal Compared with Wheat Bran.—Three experiments have been made with these feeds, using different proportions of the meal and bran. The hay and silage were the same for all the lots.

TABLE 6—EXPERIMENT I.

LOT 1.

Daily ration for each cow.	Yield of milk in pounds.					Avg. weight of cows at	
	First Week	Second Week	Third Week	Fourth Week	Total	Beginning.	Close
Johnsongrass hay..... 5 lbs Silage.....10 lbs Cottonseed meal..... 6 lbs Wheat bran ..... 4 lbs	285	277¼	293½	314½	1194½	651	660

LOT 2.

Johnsongrass hay..... 5 lbs Silage.....10 lbs Cottonseed meal..... 4 lbs Wheat bran ..... 6 lbs	253¼	245	250	265½	1012¾	829	839

LOT 3.

Johnsongrass hay..... 5 lbs Silage.....10 lbs Wheat bran.....10 lbs	257	210½	214¾	247½	929¾	681	703

Results—Lot 1, receiving the 6 pounds of cottonseed meal and 4 pounds of wheat bran, gave the largest yield of milk; lot 2, receiving 4 pounds of cottonseed meal and 6 pounds of wheat bran, gave the next largest; lot 3, receiving 10 pounds of wheat bran and no cottonseed meal, gave the poorest yield. The cows in all the lots gained in weight. Those in lot 3 weighed, at the close of the four weeks, 22 pounds each more than at the beginning, indicating that this ration at least had a tendency to fatten the cows.

TABLE 7.—EXPERIMENT II.

LOT 1.

Daily rations for each cow.	Yield of milk in pounds.					Avg. weight of cows at	
	First Week	Second Week	Third Week	Fourth Week	Total	Beginning	Close
Johnsongrass hay..... 5 lbs Silage .....10 lbs Wheat bran .....10 lbs	280½	282½	273	273	1124	660	667

LOT 2.

Johnsongrass hay ..... 5 lbs Silage.....10 lbs Cottonseed meal..... 6 lbs Wheat bran..... 4 lbs	269	267½	297½	301	1135	839	842

LOT 3.

Johnsongrass hay ..... 5 lbs Silage.....10 lbs Cottonseed meal..... 4 lbs Wheat bran ..... 6 lbs	258	288	310	307¾	1163¾	703	695

Results.—This experiment was made for the purpose of duplicating the first. The lot receiving the 6 pounds of cottonseed meal and 4 pounds of wheat bran during the first four weeks was now changed to 10 pounds of wheat bran and no cottonseed meal; the lot receiving the 4 pounds of cottonseed meal and 6 pounds of wheat bran was changed to 6 pounds of cottonseed meal and 4 pounds of wheat bran; and the lot receiving the 10 pounds of wheat bran was changed to 4 pounds of cottonseed meal and 6 pounds of wheat bran.

The results, so far as the milk yield was concerned, agree very closely with those in the first experiment. Both trials indicate the superior value, pound for pound, of cottonseed meal over the wheat bran.

TABLE 8.—EXPERIMENT III.

LOT 1.

Daily rations for each cow.	Yield of milk in pounds					Avg. weight of cow at	
	First Week	Second Week	Third Week	Fourth Week	Total	Beginning	Close
Johnsongrass hay..... 5 lbs Silage..... 10 lbs Wheat bran ..... 10 lbs	276	286½	277	282	1121½	667	660

LOT 2.

Johnsongrass hay..... 5 lbs Silage ..... 10 lbs Cottonseed meal..... 4 lbs Wheat bran ..... 4 lbs	296½	288½	286	301	1172	842	811

LOT 3.

Johnsongrass hay..... 5 lbs Silage..... 10 lbs Cottonseed meal..... 3 lbs Wheat bran ..... 6 lbs	290¼	301	295¾	307½	1194½	695	683

Results.—In this trial, lot 2, receiving 4 pounds of cottonseed meal and 4 pounds of wheat bran, gave about the same results as lot 1, which received 10 pounds of wheat bran and no cottonseed meal. Lot 3, which was fed 3 pounds of cottonseed meal and 6 pounds of wheat bran, showed a very small increase over the other two. The cows in all the lots lost slightly in weight.

The results of this experiment cannot very well be compared with those in experiment 2, because of the fact that it was made during the early spring months and the cows were getting a small amount of green feed in the pastures. In drawing our conclusions we also found it necessary to take into account the rations that were being fed to the cows of each lot in the preceding experiment.

RESULTS OF THE THREE EXPERIMENTS.

1. The ration containing the 6 pounds of cottonseed meal and 4 pounds of wheat bran was better than the one containing 4 pounds of cottonseed meal and 6 pounds of wheat bran.

2. The ration containing 4 pounds of cottonseed meal and 6 pounds of wheat bran was better than the one containing 10 pounds of wheat bran.

3. The ration containing 3 pounds of cottonseed meal and 6 pounds of wheat bran was slightly better than the ration containing 10 pounds of wheat bran.

4. The ration containing 4 pounds of cottonseed meal and 4 pounds of wheat bran was equal to the ration containing 10 pounds of wheat bran.

5. In the above rations, 4 pounds of cottonseed meal were equal to 6 pounds of wheat bran. Therefore, one pound of cottonseed meal was equal to 1.5 pounds of wheat bran.

Cowpea, Compared with Johnsongrass Hay.—Below is given a table showing the results obtained from two rations, one containing Johnsongrass hay and the other the same quantity of cowpea hay, the balance of the ration being the same for both lots. As in the previous experiments there were three cows in each lot and the experiment lasted four weeks.

TABLE 9.—SHOWING RELATIVE VALUE OF COWPEA AND JOHNSONGRASS HAY.

LOT 1.

Daily ration for each cow	Yield of milk in pounds.				
	First Week	Second Week	Third Week	Fourth Week	Total
Johnsongrass 5 lbs Silage 10 lbs Cottonseed meal 2 lbs Weat bran 4 lbs	274¼	270	281	264	1089¼

LOT 2.

Cowpea hay 5 lbs Silage 10 lbs Cottonseed meal 2 lbs Wheat bran 4 lbs	279½	270	280	276	1105½

Results.—This table shows the feeding values of cowpea hay and Johnsongrass hay to be practically the same when fed with the above quantities of cottonseed meal and wheat bran. The cows neither gained nor lost in weight. At the end of four weeks the rations were changed; that is, lot 1 was given the ration containing the cowpea hay and lot 2 the one containing Johnsongrass hay. The same results were obtained as before. It is probable that there would be a considerable difference between these hays if fed in connection with some grain feeds relatively poor in protein. Both of the above are known as narrow rations; that is, there is a larger proportion of protein to the carbohydrates and fat than is usually recommended for dairy cows.

Feeding Grain to Cows on Pasture.—In order to test the value of feeding grain to cows on good pasture the following experiment was made. The cows were divided into two lots, with three cows in lot 1, and 6 cows in lot 2. The test began April 6th and lasted twelve weeks. For the first six weeks all the cows in both lots received 4 pounds of cottonseed meal and 6 pounds of wheat bran a day. During the last six weeks, lot 1 received no grain ration and lot 2 was fed 3 pounds of cottonseed meal and 4 pounds of wheat bran a day. The table below gives the yield of milk for each weak:

TABLE 10.—SHOWING EFFECT OF GRAIN FEED WHILE ON PASTURE: YIELD OF MILK IN POUNDS.

LOT 1.

NAME OF COW.	First week	Second week	Third week	Fourth week	Fifth week	Sixth week	Total	Seventh week	Eighth week	Ninth week	Tenth week	Eleventh week	Twelfth week	Total
Bessie Russell	74.0	85.0	99.0	110.0	104.7	105.5	**578.2**	103.7	95.0	84.0	88.2	85.5	82.2	**538.6**
Meg of M	95.2	91.0	95.2	91.7	81.0	82.2	**536.8**	74.2	74.7	66.7	75.5	65.0	66.0	**422.6**
Margery K	92.0	83.2	82.7	91.2	85.5	92.5	**527.1**	77.2	75.0	68.0	72.2	64.5	60.0	**422.1**

LOT 2.

Venona Pogis	98.2	103.7	100.7	108.5	109.5	104.7	**625.3**	102.0	107.7	98.0	104.2	96.5	96.5	**604.9**
Timola	168.5	160.5	140.5	155.5	169.0	170.2	**964.2**	164.5	165.5	159.7	156.7	147.7	145.2	**939.3**
Poga Minka	69.0	67.2	72.0	78.5	81.0	80.2	**447.9**	82.5	85.5	82.5	85.7	83.5	81.2	**500.9**
Tobira, 2nd	131.7	127.7	131.0	134.7	122.7	127.0	**774.8**	127.0	121.2	110.2	107.0	100.7	101.2	**667.3**
Anastasia R	108.2	107.5	108.0	104.0	100.0	104.0	**631.7**	94.7	93.0	71.0	83.0	77.2	71.5	**490.4**
Loui L	121.0	129.0	130.5	138.7	149.5	146.2	**814.9**	146.5	145.0	132.7	134.2	115.7	117.0	**791.1**

Results.—Owing to the continued rains and the influence of the horn-fly on the herd during the latter part of this experiment, all the cows decreased in the flow of milk, but there was not enough difference in the yield of milk in favor of those receiving the grain ration to justify its use. It is a fact that cottonseed meal and cotton seed have a tendency to raise the melting point of butter and by so doing to increase its firmness. It may, therefore, be found profitable to use a small amount of these feeds during the summer months, even though the cows are getting all the green feed necessary, in order that the butter may reach the market in better condition.

Relative Values of Grain Feeds.—For a number of years this station has been at work testing, by actual feeding, the relative values of some of the most common grain feeds used by our dairymen and farmers. The value of thoroughly reliable data along this line can hardly be over-estimated. If the feeder will use the values given, he will be able to select feeds which will give the greatest returns for the least money. The following is a summary of the work done:

1. One pound of cottonseed meal equals 2.00 lbs. corn and cob meal; equals 1.71 lbs. cotton seed; equals 1.5 lbs. wheat bran.

2. One pound of cotton seed equals 1.17 lbs. corn and cob meal; equals 0.88 lbs. of wheat bran; equals 0.58 lbs. cottonseed meal.

3. One pound of wheat bran equals 0.67 lbs. of cottonseed meal; equals 1.14 lbs. cottonseed; equals 1.33 lbs. of corn and cob meal.

4. One pound of corn and cob meal equals 0.50 lbs. cottonseed meal; equals 0.75 lbs. of wheat bran; equals 0.85 lbs. cottonseed.

The table below shows the relative prices per ton which should be paid for the following feeds when calculated on the basis of the above values:

TABLE 11.—RELATIVE FEEDING VALUES OF GRAIN.

Cotton seed, per ton.	Cotton seed, per bushel.	Cotton seed meal, per ton	Wheat bran, per ton.	Corn, per ton.	Corn, per bushel.
	Cents.				Cents.
$ 6.00	10	$ 10.26	$ 6.84	$ 5.13	14.3
9.00	15	15.39	10.26	7.70	21.6
12.00	20	20.52	13.68	10.26	28.5
15.00	25	25.65	17.10	12.82	35.9
16.70	27.8	28.56	19.04	14.28	40.0

From this table we get a number of important facts. We often ask ourselves the question: Would it it be economy to sell our cotton seed and buy cottonseed meal? Let us suppose that we can sell the seed for fifteen cents a bushel and that the meal will cost us $20.00 per ton. By referring to the table we find that when the seed are worth 15 cents for feeding the meal is only worth $15.39 a ton. It would, therefore, not be profitable to make the exchange at these prices. On the other hand, if we had corn that could be disposed of at 40 cents a bushel and could buy cottonseed meal at $20.00 a ton it would pay us to make the exchange, for when corn is worth 40 cents for feeding the cottonseed meal is worth $28.56 per ton.

Manurial Value of Above Feeds.—In the calculation of the relative values of the above feeding stuffs we have only considered their feeding values, but the careful farmer will get not only a feeding value, but a manurial value as well from all crops fed to live stock. As the value of the manure is not the same for all feeds we give the following table, taken from Bulletin 60 of this station, which contains the results of experiments made by the station chemist, Mr. W. R. Perkins:

"TABLE 12.–Cost, Manurial Value of Manure from Some Common Feeding Stuffs.

Feeding Stuff.	Cost per ton.	Manurial Value per ton.	Value of Manure from one ton.
Corn	$14.20	$ 5.65	$ 4.80
Corn and cob meal	11.40	4.56	3.87
Cotton seed	6.00	10.70	9.09
Cottonseed meal	17.00	22.52	19.13
Cottonseed hulls	3.25	2.99	2.54
Wheat bran	18.00	11.17	9.49
Johnsongrass hay	6.00	4.24	3.60

"The one point emphasized in such a table is that cottonseed, and its products hulls and meal, especially the seed, at the customary prices, are the most remarkable feeding stuffs to be found anywhere. They may be fed to cattle recklessly, even wastefully, and if provision is made to save the waste and all of the excrement there will be more fertilizing value in the manure heap than the seed cost."

RATIONS FOR DAIRY COWS.

While the different feeds vary in their values, it is not profitable to use only one or two feeds. However much we may enjoy bread as a part of our diet, we could not live on bread alone, neither would we be content with two or three kinds of food if forced to eat these continuously without any change. The same is true of the dairy cow. If we would secure the largest and most profitable yields we must give a variety. A mixture of two grains will give a higher yield than the same amount of food given in one grain, and four or five kinds will usually give better returns than two. The larger portion may consist of the grain feed selected as the cheapest, its value of course considered, and the smaller portion made up of such grains as will form a suitable mixture. Sudden changes from one feed to another should never be made, as they, in most cases, decrease the flow of milk, even when the new ration is better than the one the cow is accustomed to. When a change is necessary it should be gradual, extending over a period of a week or ten days.

The following are some rations that will give good results. They are calculated for cows in full flow of milk and weighing between 800 and 1,000 pounds:

RATION 1.	POUNDS
Johnsongrass hay	10
Cottonseed hulls	15
Cottonseed meal	4

RATION 2.	POUNDS
Cowpea hay	20
Wheat bran	6
Corn meal	3

RATION 3.	POUNDS
Johnsongrass hay	20
Cottonseed meal	2
Wheat bran	2
Corn meal	2

RATION 4.	POUNDS
Cowpea hay	10
Cottonseed hulls	15
Cottonseed meal	3

RATION 5.	POUNDS
Bermuda hay	18
Cottonseed meal	2
Wheat bran	3
Corn and cob meal	3

RATION 6.	POUNDS
Cowpea hay	10
Johnsongrass hay	10
Wheat bran	3
Cotton seed	6

Most of the above rations have been used in feeding the station herd of cows and have proven entirely satisfactory. The same quantity of any of the leguminous hays may be substituted for the cowpea hay and any of the grass hays may be used in place of those given if they are of good quality. A ration is the amount of food that one cow eats in twenty-four hours. Therefore, if the cows are fed twice a day, one-half of the above amounts should be given at each feed.

As there are a great many farmers and dairymen who measure the feed rather than weigh it, a table is given below showing the relative weights and measures of the grain feeds commonly used:

	1 Quart	½ Gallon	1 Gallon
Cottonseed meal.....lbs	1.82	3.64	7.28
Cotton seed ..... "	1.16	2.32	4.64
Wheat bran ..... "	.87	1.74	3.48
Corn meal..... "	1.74	3.48	6.96
Corn and cob meal ..... "	1.59	3.18	6.36

FEEDING THE DAIRY COW.

Time of Calving.—The greatest yield of milk and butter is obtained from cows calving in the fall. With proper care and attention they will give good returns during the fall and winter months and when turned to pasture in the early spring a fresh flow will be started which will considerably increase the year's yield.

Winter dairying furnishes profitable employment at a season of the year when other work is not pressing and dairy products bring a higher price. More time can also be given to the raising of the calves, and less trouble will be experienced from the heat, sour milk, diarrhoea, and flies than during the summer, and the calves can go from skim milk to good pastures when they are just old enough to make the best use of them. The feed and care of the cow for the first three months after calving will largely determine the amount of milk and butter the cow will produce during the year. At the time of calving the cow should be fed light, laxative feeds; such as wheat bran, and all the hay and water that she wants. As soon as she has recovered from calving the feed should be gradually increased until the full limit of profitable feeding is reached. We usually take from two to three months to get the cows on full rations. After the cow begins to decrease in her flow of milk the ration should be reduced. In the feeding of a herd of dairy cows, the judgment of the feeder must always play a very important part, and the best results will be secured by those who change the rations to suit the taste and requirements of the individual cow.

REARING CALVES FOR THE DAIRY.

Where the calf is allowed to run with the dam few precautions are necessary, the most important being to see that the calf does not get too much milk. As this method is a very expensive one, and one not calculated to give the best returns from the dairy herd, it should be discontinued. If a few simple rules are intelligently followed good dairy calves can be raised almost entirely on skim milk. The calf should be taken from its dam not later than three days after it is dropped and given 8 to 10 pounds of whole milk or milk fresh from its dam in three feeds a day for ten days or two weeks. At the end of this time some skim milk may be substituted for a part of the whole milk. Change gradually from whole milk to skim milk, taking about ten days to make the change. The calf would then be a little over three weeks old when we begin to feed entirely on skim milk. When the calf is four to five weeks old it may be fed only twice a day. As the fat has been removed from the skim milk it is necessary to replace this with some food and for this we have found nothing better than corn meal. About two tablepoonsfuls should be mixed with the skim milk just before it is fed. This can be gradually increased as the calf grows older.

Regularity is a necessary condition to success in calf feeding. The calves should be fed at the same time each day. Very little more skim milk should be given than whole milk when the change is made and it should always be fed warm. It should be of the same temperature as the milk when first drawn from the udder of the cow, and should be perfectly sweet. The feeding pail should be kept scrupulously clean by scalding once a day.

The calf should be taught to eat as soon as possible, which may easily be done by putting a little meal into its mouth just after feeding the skim milk. Bran or ground oats, or better still, a mixture of wheat bran, oats and corn meal makes a desirable feed for the calf.

We have kept an account of the average cost of the feed eaten by six calves until six months old when raised by the above method. It is as follows:

167 pounds of whole milk at 1½ cents	$2.50
1,950 pounds of skim milk at 20 cents per 100 pounds	3.90
95 pounds of mixed feed (corn, oats and bran)	.95
Total for each calf	$7.35

In addition to the above the calves were kept on a good pasture for the entire time after they were old enough to eat grass.

INFLUENCE OF THE FEED ON THE QUALITY OF MILK AND BUTTER.

Per Cent of Fat in Milk.—The opinion held by many that the food eaten influences the per cent of fat in the milk is now regarded as erroneous by most scientific men. A large number of experiments have been conducted by the experiment stations throughout the country with the almost invariable result that there is no PERMANENT change produced by the feed. It is possible to vary the percentage for a short period, but this is more probably brought about by NERVOUS influences than by the character of the food.

During the feeding trials reported in bulletin 60 a sample of milk was taken from each cow about twice a week and the per cent of fat determined by the Babcock tester, and there was no permanent change due to the feed. There was, of course, a large difference due to the individual animal. Often a very decided variation would follow a sudden change of feed, but the cow would soon begin to give the normal amount again.

Effect of the Feed on the Composition of the Butter Fat.—That the feed influences in some way the character of the fat in milk is now generally accepted as true, but there is a lack of agreement among scientific men as to just what effect a certain food has on this fat.

The average melting point of butter made from cows fed five pounds of cottonseed meal a day, as determined by several tests made by this station is 100.1 degrees F., while that from cows fed corn meal and wheat bran, as a grain ration, is 96.8 degrees F. The butter from the cottonseed meal or cotton seed is therefore firmer and will stand shipment better during the summer months than will that made from cows receiving no cotton seed or meal. No deleterious effect on the composition of the butter fat

has been detected when the cows were getting as much as five pounds of the meal or six pounds of seed.

Quality of the Butter.—The statement is often made that a good quality of butter cannot be produced from cows receiving a ration consisting largely of cotton seed or cottonseed meal. In order to determine whether or not this is true, the entire station herd was fed for two weeks on the following ration:

DAILY RATION FOR EACH COW.

Peavine hay	10 pounds.
Corn silage	20 "
Wheat bran	4 "
Cottonseed meal	5 "

The milk from this herd for the last two days was separated, the cream properly ripened, and the butter made from this cream, as well as the two following lots, was sent to M. M. McKeen & Co., St. Louis, Mo., to be scored.

At the end of two weeks six pounds of cotton seed were substituted for the meal, the rest of the ration remaining the same. The cows were fed two weeks on this and the milk of the last two days was treated in the same way as the first.

A third ration in which six pounds of corn and cob meal, instead of the cottonseed meal, was next fed to the herd for two weeks, and the milk of the last two days treated like that of the preceding lots. Below is given a table showing the score of the three lots of butter, and also a column showing the score of perfect butter.

SCORE OF BUTTER.

	Perfect score.	Score of butter from herd receiving cotton seed meal.	Score of butter from herd receiving cotton seed.	Score of butter from herd receiving corn and cob meal.
Flavor	45	43½	43	43
Texture	30	28	28	28
Color	10	10	10	10
Salt	10	9	10	10
Packing	5	5	5	5
Total	100	95½	96	96

Results.—The third ration fed, that is, peavine hay, silage, wheat bran and corn and cob meal is considered a good one by most dairymen for producing butter of an excellent quality and it was included in this trial in order to compare the quality of the product from this lot with those in which cotton seed or cotton-seed meal constituted the principal part of the grain fed.

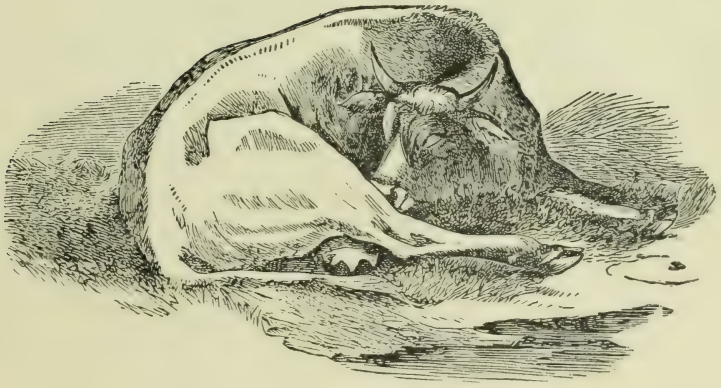
The butter made from the herd when it was getting cotton-seed scored 96 points out of a possible hundred, which was the same score as that made by the butter from the herd getting corn and cob meal. The score of the butter made from the herd getting cottonseed meal was 95½ points, but it will be noticed that it had the best flavor and had it been properly salted would have received the highest score.

Mississippi Agricultural Experiment Station.

BULLETIN No. 71.

MILK FEVER.

By J. C. ROBERT.



Cow sick with Parturient Paralysis. "Milk Fever." (Armtage.)

AGRICULTURAL COLLEGE, MISS.,

JANUARY, 1902.

MISSISSIPPI STATIONERY CO., YAZOO CITY.

MILK FEVER.

Parturient paralysis, parturient apoplexy, or "milk fever" is the name applied to the disease peculiar to cows seen at or about the time of calving. The disease is one especially to be dreaded because it occurs only in deep milkers at the prime of life, and has usually resulted in death. The name "milk fever" is misleading since there is no fever when the disease is uncomplicated, but frequently a subnormal temperature.

Cause.—The pathology of this disease is not well understood. Many theories concerning its production have been advanced, the latest and most rational of which is that given by a Danish veterinarian, J. Schmidt, which is as follows: viz.; that the disease is due to a poison generated in the udder and absorbed by the system. The sudden increased flow of milk incident to birth of the calf results in casting off into the milk channels great quantities of glandular cells. These decompose, form poisons, are absorbed into the circulation, permeate the tissues, and produce auto-intoxication. The toxic effect of this poison is especially manifested by the nervous system resulting in paralysis, hence the name, parturient (at the time of birth) paralysis.

Symptoms.—These usually occur from a few hours to three or four days after birth of the calf, (in rare cases a few weeks after calving), and, as a rule, follow an easy and rapid delivery. The symptoms are mainly those of nervous disturbance. At the onset of the disease the cow becomes excited, she moves around the lot or pasture as if in pain; may lie down and then get up immediately, turn head to side, and kick at flank; groans, and grinds her teeth. Later, she loses control of her muscular power as seen in dragging the hind legs, staggers, lies down and rises with great difficulty, finally becomes so paralyzed that she cannot rise at all. When down she usually rests upon her chest with head turned to the side or flank, but she may stretch her head out straight. The bowels and urinary bladder are more or less paralyzed, resulting in a torpid

condition of intestine and retention of urine. Later, loss of reflex motion occurs, so that the eye-ball may be touched with the finger and she may not close the lid. The pharynx and gullet are unable to take food to the stomach, so that an effort to drench the cow is apt to result in death, by the liquid entering the lungs and producing broncho-pneumonia from irritation of the bronchial tubes or possibly, producing immediate suffocation and death. As the stomach and intestines are paralyzed, the food may ferment and cause the animal to become bloated. The pulse is rapid and weak (60 to 120 per minute), respiration labored, and temperature about normal (100.5 to 102.0 degrees F.), in some cases the temperature is sub-normal.

Treatment.—*Preventative.*—Since parturient apoplexy is almost invariably confined to *deep milkers at the time of parturition*, our efforts should be directed towards lessening the activity of the udder at that time. This may be done by scanty feeding for a few days before she calves. If the cow is on a rich pasture, change her to a poor one. Cows kept on rich pastures seem just as subject to the disease as those that are stall-fed. We should see that the bowels are not costive. This condition may be obviated by giving daily a little laxative food, or giving one-fourth or one-half dose of Epsom salts.

It is very important that the cow have sufficient exercise, and it would be quite a mistake to confine her in a stable waiting for her to calve. Since the disease seems to be produced by an absorption into the general circulation of decomposed, cast-off glandular cells, it would appear quite rational to milk out the udder thoroughly two or three times daily just before calving, especially when a cow seems predisposed to the disease. We have never tried this but some practitioners have, and they report good results. We have, however, had good results by restricting the diet and giving sufficient exercise.

Curative Treatment.—But few diseases probably, have given rise to the use of so many drugs as this one. Many cases have been aggravated and some killed by internal medication. Schmidt's treatment, based upon his theory of its cause, is to infuse into each quarter of the

udder a solution of iodide of potash. The idea of this infusion is to neutralize the poison and temporarily lessen the activity of the udder. This seems to be the effect of the potash, which has, in the majority of cases, been followed by speedy recovery. We have not had extensive experience with Schmidt's treatment, but sufficient to convince us of its efficiency; and it has proven by far the best we have ever used.

This treatment is in detail as follows: Wash the udder, and teats of the animal, and hands of the operator with soap and warm water, so as to remove all dirt and trash. After this, wash especially the orifice of the teats, with some strong antiseptic, say a 5 per cent. watery solution of creolin or carbolic acid. From two to three drams of iodide of potash (depending upon the size of the cow) are dissolved in 1 quart of boiled water that is perfectly clear. It is better to use distilled water if we can secure it. This solution is infused into the udder by means of a small glass funnel, to which is attached one end of a rubber tube of sufficient length and one-eighth of an inch in diameter. The other end of the rubber is attached to an ordinary milk tube. Before using, the funnel, tube, and rubber should be sterilized by placing them in cold water and boiling. Milk each teat carefully so as to remove all milk from the udder, and then insert the milk tube into the teat and pour in the fluid having it about the temperature of the body; first, hold the funnel on a level with the teat while filling it, then elevate funnel so that the potash solution flows into the udder. Use one-fourth of it in each quarter of the udder. Rub the udder for 10 or 15 minutes, and in about an hour milk all out that can be removed. If necessary, this treatment may be repeated in from 8 to 12 hours.

In addition to the iodide of potash treatment, we should place the cow upon a comfortable bed of straw, rub the feet, legs, and back to excite free circulation of the blood. Inject warm water containing 4 to 6 ounces of glycerine into the lower bowels to move them. If the cow is down and cannot rise, remove the urine every eight hours by means of an ordinary large soft rubber catheter. The catheter guarded by the index finger, is passed along the floor of the

vagina, where we find a small opening about 4 inches from the vulva which leads into the bladder. If the cow can swallow well, we should drench with from one to one and a half pounds Epsom salts combined with three ounces of ground ginger. When the cow cannot swallow some advocate passing a three-fourth inch rubber hose about 7 or 8 feet long, after oiling it, down the gullet to the stomach and then pouring in the drench. *Do not try to drench when the cow is paralyzed*, as some of the liquid will enter the lungs and sooner or later result in death. The constipation, we think, is of comparatively minor importance, so you should never try to drench when the disease has reached the stage of paralysis.

If the cow becomes bloated sufficiently to interfere with the breathing, the paunch should be punctured (on the left side at a point equally distant from the last rib, hip-bone and back-bone) with a trocar and canula. Use great care in disinfecting the instruments and skin of animal, and in withdrawing the instrument hold the skin firmly against the abdominal muscles. The hypodermic use of such drugs as caffeine, strychnia, eserine, and pilocarpin give good results in some cases.

Within the last few weeks I have had 4 cases of parturient paralysis, treated them with Schmidt's treatment with result of a rapid recovery of three. Two of the cases that recovered were completely paralyzed before seen by me; two of them received one infusion of iodide of potash, one received two infusions of this drug and recovered; one died before the second infusion was made.

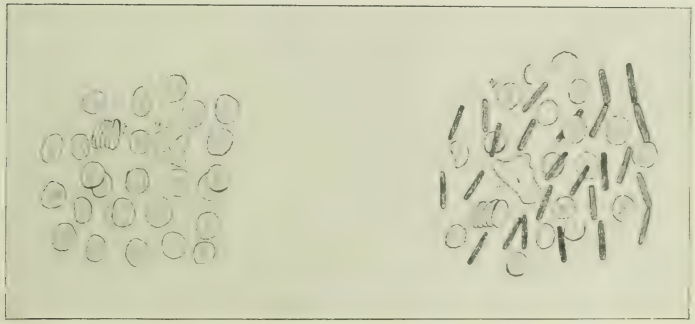
Dr. Leonard Pearson, of Pennsylvania, sent out circular letters to a number of veterinarians in reference to this subject and showed that 75 per cent. of the cows treated by the iodide of potash solution recovered; Danish statistics claim 90 per cent of recoveries in 412 cases; a German writer claims 82 per cent cures; and Dr. Jno. J. Repp, of Iowa, has collected statistics of 166 cases in Iowa, with results of recoveries in about 76 per cent in uncomplicated parturient paralysis, by use of Schmidt's treatment. Where a funnel, milk tube, and rubber tubing cannot be had one may readily use a very small, soft rubber catheter to enter the teat and a small, hard rubber syringe to inject the fluid therein.

Mississippi Agricultural Experiment Station.

BULLETIN No. 72.

ANTHRAX.

By J. C. ROBERT.



Blood Cells from Healthy Mule.

1. Red blood cells.
2. White blood cell.
3. Red blood cells, adhering to each other.

Blood Cells and Anthrax Germs taken from Stomach of a Horse-fly Found on Mule Having Anthrax.

1. Anthrax bacillus.
2. Red blood cell.
3. Partly destroyed red blood cell.
4. White blood cell.

DRAWINGS PHOTOGRAPHED AND GREATLY MAGNIFIED.

AGRICULTURAL COLLEGE, MISS.,

JANUARY, 1902.

MISSISSIPPI STATIONERY CO., YAZOO CITY.

ANTHRAX.

The disease among domestic animals commonly known in Mississippi as charbon, bears a very important financial relation to our live-stock industry. Like most other infectious diseases it has proven very much more destructive some years than others. Serious outbreaks have occured in Mississippi in 1868, 1878, 1889 and 1901. So far as we can learn "Charbon" has been occasionally epidemic in Mississippi ever since 1836, and at times it has, in some sections, greatly embarrassed all farming operations. During last year an extremely fatal epidemic of anthrax occured in some sections of our state. In view of this fact, and of the probability of its recurrence this year (unless the proper means are used to prevent it), it has been thought best to include in a bulletin a short article on the nature of charbon and the best means to prevent and suppress it.

History.—Anthrax is the oldest contagious disease of domestic animals of which we have any record. In profane history the disease is more or less accurately described before the Christian era. In sacred history it seems to be identical with the dreadful Egyptian scourge described as the "Sixth plague." Plutarch mentions outbreaks of anthrax in Rome about 740 B. C. Another writer of Italian history says that the disease was extremely fatal to live stock towards the middle and last of the sixteenth century, A. D. Unscrupulous meat vendors at times sold such diseased meat to their customers which resulted in many cases of death from anthrax in man. On this account the senate at Venice prohibited, under penalty of capital punishment, the offering for sale of the meat of cattle affected by anthrax.

In 1868 in Sharkey County, Mississippi, we are told that in addition to domestic live stock having the disease numerous deer were found in the woods victims of the same malady. During the same year one man is reported to have lost 40 out of 40 mules, another 50, out of 60 mules, with charbon.

In our visits to the Delta we tried to trace the history of the last outbreak of anthrax. It was practically impossible to visit every point of infection, and not possible to secure accurate information in every case. We heard that charbon appeared at Pine Bluff on the Arkansas river about the last of May, but we cannot speak positively as to this. We know that it started on Big Island, Ark. the first part of June. Mr Murray, who is connected with a lumber company on Big Island, says that the first animal he knew to have the disease there was a milch cow that came up one evening in a feverish condition with a slight swelling on her neck. The cow belonged to the lumber company and a negro was instructed to rub the swelling with turpentine. In about half an hour after first observed to be sick she was dead. The next animals to contract it were four mules, at least two of which had no visible swellings and died in about an hour after they showed first symptoms of sickness. At that time the nature of the disease was not known by the owner of this stock and some carcasses were thrown into the river.

On Thursday June 13th the first case developed in a mule at Terrene Bolivar Co., Miss. On June 14th two other mules showed symptoms of the disease. Terrene is a river landing below the mouth of White river, where the stock on Big Island, Ark., were infected. It is interesting to note that the above mentioned mules, the first on the Mississippi side of the river to develop charbon were, when the disease developed, plowing on the inside of the levee along the river bank. It is very probable that these mules were bitten by flies coming from charbonous carcasses as they floated down the river. The planters, of course, did not approve of throwing such carcasses into the river, but it was much easier for a negro living near the river, when he lost a mule, to thus dispose of him than to burn or deeply bury him. A party said that while on a boat excursion he counted 25 carcasses in the water. Another person said that he counted 16 dead mules in a bend of the river against drift wood. The pilot of the river boat "Delta" said that a great many carcasses had floated down the river. On Monday July 8th the carcass of a mule was caught in a wheel of the "Delta" and so injured it that the boat had to stop several hours to repair damages. As soon as the disease was well understood stringent sanitary regulations were enforced by some of the city officials and by the county officials, and a change for the better was soon experienced after such regulations were enacted. There can be but little doubt to any unbiased mind that the disease spread many

miles in this way. Bolivar county has about 50 miles river front and for at least 25 miles along the river this disease, in a more or less severe type, could be seen. The disease spread along the river front almost invariably in a direction down stream. From the first point of infection at Terrene it spread in all directions. The owner of this stock at Terrene told us that he had on his farm 55 mules, of these he lost 39 with charbon, 12 of the remaining 16 had the disease and recovered, 4 only escaped the infection. Another planter, Mr. Chas. Scott, having places joining Terrene, lost 206 out of 430 mules. Mr. Dave Reinache a planter of the same community lost 30 out of 70 mules, 9 out of 12 cows, and 2 out of 40 sheep. Capt. Winter, a levee contractor, lost 40 out of 46 mules. At Benoit in Bolivar county we were told that one man lost 29 out of 40 mules and that about 160 others had died near the same town. While the above mentioned planters and scores of others we have not mentioned lost heavily, their loss was not as great in proportion to their means as was that sustained by many farmers operating on a small scale. Many of these owned only 4, 6, or 8 mules and lost them all. At and around Grace, Issaquena Co., a small town about 100 miles south of Terrene, Senator Dulaney said that 27 mules had died. At Rolling Fork, Sharkey county, a point some 15 or 20 miles south of Grace, I heard of only 7 cases with two deaths one of which was a cow. I saw only 4 of these cases, and made microscopic examination of the blood of two cases that were recovering, but failed to discover the anthrax bacillus. Carbon has also been reported at New Town Landing, south Warren county and along the river in Claiborn, Jefferson and Adams counties and also in Holmes and Hinds counties. In Adams county it is said to have occured at Quitman Landing, a few miles north of Natchez. While we have no accurate data as to the loss in dollars and cents sustained by our State during the last summer from this dreadful scourge, we feel safe in estimating that it would not fall far short of a quarter of a million dollars.

Nature of Disease.—Charbon is a specific infectious disease of the lower animals readily communicable to man, due to the growth in the body of a short rod-shaped bacterium (the bacillus anthracis). Under the microscope the little rods appear to be about four or five times as long as they are thick. In the blood it multiplies by becoming elongated and dividing; thus one forms two, four, etc.; each new organism continuing the same process indefinitely. The disease cannot

possibly exist without the presence of this germ. In the body it breaks down the red blood cells and, as a rule, sooner or later results in death. Outside the body this rod-like plant goes to seed under circumstances not favorable for its development. These seeds or spores can stand both the heat and cold of our climate, and exist for years without loss of vitality. They are hard to destroy by germicides, hence the necessity of burning the bodies of all animals that die of charbon. These spores may be brought to the top of the ground by earth-worms when the carcasses are improperly buried. In the spring, when the river is rising, parts of such carcasses may be washed up and thousands of these little seeds washed away to infect other points. The practice of throwing such carcasses into the river cannot be too severely condemned, for infection may in this way be carried miles away.

Concerning the liability to infection by the anthrax germ, most authors classify the lower animals in the following order: ox, sheep, goat, horse, stag, antelope, deer, camel, cat, rabbit, guinea-pig, mouse, hare, tame-rabbit, dog, pig and fox. Ducks, chickens and pigeons are said to contract the disease in severe epidemics, while birds of prey are refractory to it. In the recent epidemic of anthrax we have experienced, our observations do not coincide exactly with the above order of receptivity. On one farm where a milch cow died of anthrax during the night there were in the same lot 30 hogs and about 20 head of sheep. During the night some of the hogs ate the entire udder and part of the abdominal muscles of the cow and within a few days fifteen of the hogs died of the same disease. The sheep kept constantly in the same lot at night, and when I last heard from them—some four weeks after death of the cow and hogs—not a single one had contracted the disease. We think that this can be explained, however, by the fact that there was no grazing in the lot and that the sheep were not sheared, hence were not very subject to the bite of insects. The following animals contracted anthrax in this epidemic: mules, horses, cattle, hogs, goats, sheep and dogs. We were told that chickens on a certain badly infected farm also died of charbon, but we did not have an opportunity to confirm this by microscopic examination of their blood. During an outbreak of charbon that we saw in Tunica county three years ago, some little pigs crawled through the cracks of their pen, went several hundred yards and ate parts of a charbonous carcass that had been left on the commons. Within a few days the pigs died; the half starved mothers ate parts of the pigs and they too died of charbon.

The charbon germs may gain access to the body (1) by the feed, grass, hay, grain or drinking water; (2) by the bites of flies and other insects that have previously bitten diseased animals; (3) by the germs gaining access to wounds, and (4) by the parasite entering the lungs.

The rapid spread of our recent epidemic of charbon has, we feel sure, been due *mainly* to the inoculation of healthy animals with anthrax virus by the bite of insects. There are several species of horse-fly common in our state probably all of which have aided in disseminating this virus. The disease seemed to spread more rapidly with the increase in number of flies; and where there were few flies the contagion did not appear to spread so rapidly. There is a small grey horse-fly called by some of the planters the "charbon-fly" on account of their supposed ability to originate charbon. In some parts of the country these little pests were seen by the millions. The flies cannot in and of themselves produce charbon, but they may by abstracting quantities of blood so deplete the system as to render it more subject to the disease. They cannot cause the disease in any other way than by disseminating virus. This one can do, (1) by sucking blood from a diseased animal then running his long infected proboscis into a capillary blood vessel of a healthy animal thus inoculating him; (2) by carrying infected material on his feet to infest other animals; (3) probably after death of the fly the germs may undergo spore formation and thus make a new focus of infection where the fly dies or wherever his disintegrated stomach mixed with dust may be blown. Recently we caught a fly sucking blood from a mule with anthrax. We decapitated the fly, dissected out his stomach, spread some of the blood from stomach of the fly upon a cover glass and by means of the microscope in a few minutes demonstrated the presence of numerous anthrax germs in the blood from the fly as well as that taken directly from the mule. The half-tone on title page is from a drawing we made upon dissecting the fly.

Symptoms.—These vary with the virulence of the attack and the mode of infection. If infection has taken place from within, as by infected food, the system may be thoroughly infested with germs without local swellings and even before we are aware the animal is sick. In such a case the animal may show nervous symptoms which is followed by profound stupor, interrupted occasionally by periods of excitement. The fever increases, pulse weak and rapid (from 75 to 120 perminute).

The mucous membranes of the body become bluish in color and the breathing rapid. In such an acute attack of the disease the animal may die in from twenty to thirty minutes after first symptoms of anthrax are noticed. In a levee camp which I visited a few years ago the contractor had all of the mules he thought to be healthy taken out early in the morning and put to work. About 9 o'clock one of his best animals appeared to be sick, presenting about the symptoms I have already described. The harness was at once removed, the animal rested a few minutes in the shade and then started to the camp, but died before reaching it. In some cases the nervous symptoms predominate, breathing becomes loud and labored, the animal may rear up in a fit of delirium, utter groans of agony, and suddenly fall dead.

Most cases of anthrax are much slower than the above mentioned type, lasting from a few hours to several days and are accompanied by more or less swelling on some part of the body. These swellings occur as a rule along the belly, sheath, udder, chest, neck or throat. They often start as the result of inoculation by the bite of an insect as already indicated. The rapid and progressive swelling is produced by increased flow of blood to the part in order that the white blood cells—the sentinels or "scavengers" as they are sometimes called—may, if possible, rid the system of the intruding charbon germ. The result, alas! between these two is too often that the bacillus anthracis increases more rapidly than does the white blood cells and becomes the more successful of the two combatants, resulting in an ever increasing œdematous swelling with progressive emaciation, weakness and death. If on the other hand the infectious germ has, by some agency been weakened and is not capable of extremely rapid multiplication, the application of a liniment to the local swelling will stimulate the activity of the leucocytes (white blood cells), and these may overcome the germ. The administration of a purgative and laxative food will aid the blood in eliminating waste products of broken-down tissue. In this case we will have fever and more or less weakness but this will be followed by a restoration of all the functions to their normal conditions, and a healthful state of the system. In such cases the animal may require from a few days to two or three weeks to recover.—One can readily see that bleeding the animal only lessens the number of white blood cells at the command of the system and lessens chances for recovery. Some, however, get well *in spite* of bleeding.

Treatment.—The experiences of all countries and ages shows

that in dealing with charbon we must rely on preventive measures.

1. Establish a rigid quarantine. It is just as impossible for us to check and prevent charbon without such sanitary measures as it is to suppress smallpox or yellow fever without obeying this all-important law. Place all sick animals in a small inclosure to themselves—at least one-half mile away from all healthy ones. Move the healthy animals to a new and uninfected lot. It is very necessary to have the sick and healthy animals thus separated, as *flies will go from sick to the well animals and readily inoculate them.*

Sometimes a person is at a loss to know how his stock came in contact with the virus of certain contagious diseases. During the recent epidemic charbon occured among mules belonging to a Mr. Edwards who lives some distance from the Mississippi river. Upon looking for the immediate source of infection it was found that a negro living upon an adjoining place had ridden a mule to the river near Terrene (where the disease started) to catch some fish. The negro's mule contracted the disease and spread it among Mr. Edward's mules before he could protect them by vaccination. We should not only put the sick and healthy mules in separate enclosures but lock them up securely. In the South where we have on every plantation many negro families, it is very important to see that in an epidemic like this the mules are not ridden at night. During this panic charbon appeared on two of the State convict farms but there the managers found it more easy to stamp out the disease, for at night they lock up the negroes instead of the mules.

We should try in every way possible to protect the healthy animals from flies. If we can, rest them in a dark stable. We may prepare an offensive application as follows: Cut one-half pound of hard soap into small pieces and dissolve in one gallon of boiling water, pour into this two gallons of fish oil and stir until cool. For use, add one part of the emulsion to from six to twelve of pure water. Apply to the body once or twice daily with a broom or brush. Gnat oils, sold by some druggists, are very highly recommended. Strong solutions of Chloral-napthallum seems to be an efficient agent. Smoke in the lot will aid in repelling flies. Coals of fire mixed with cotton seed or other organic matter may be placed in tin buckets and hung on the harness so as to keep smoke about the animals while at work. Screens should be placed over the windows and about doors of the stable. Flies are worse in the afternoon and early in the mornings so it is well to be especially careful to prevent them at that

time. When we can do so, it is well not to take them out in the morning until late and replace them in the dark stable early in the afternoon.

(2) Burn the carcasses of all animals that die of charbon. This is very necessary, as parts of the single carcass may be scattered far by insects, dogs, and buzzards, and result in infecting many healthy animals. The animal should be burned where he dies. If this cannot be done, he should not be dragged over the ground and in that way run the risk of infecting everything the body touches. If he *must* be hauled away to burn, plug the natural openings with cotton or some soft substance to prevent infectious material escaping, and haul on a slide so that the boards upon which the carcass has been placed may be burned. The carcass may be burned much more easily if we dig two trenches about two feet wide, two feet deep, and six or eight feet long so that they cross each other in their middle. Place pieces of iron or green poles across these trenches where they meet, place the carcass on these poles, light-wood below, heavier wood above, saturate with coal oil, and set on fire. In this way the carcass of a horse or mule may be burnt up, in a few hours by the use of about ¾ of a cord of wood. Some states have a law to the effect that all animals found to have anthrax are killed and at once destroyed, and all animals on adjoining places vaccinated. I learned that recently anthrax appeared on a farm in the Delta belonging to Mr. Kirk. There were about 50 mules on this farm two of which contracted charbon. Mr. Kirk had these taken away, shot and burned, and lost no other animals from the disease.

If buried, however, the body should be under at least four feet of earth, away from running water, and covered with chloride of lime before covering with dirt.

(3) Vaccinate all animals that have not contracted the disease. We cannot leave this subject without urging the absolute necessity of vaccinating each year, early in the spring, all live stock in permanently infected districts. The efficiency of vaccination as a preventive agent has proven itself beyond doubt to be the best and only successful means of preventing anthrax occuring among animals in infected regions. In a report of a commission appointed by the French government to investigate this subject it is shown that where the animals were exposed directly to the infection of anthrax that the mortality was reduced from 80 per cent. to about 1 per cent. when protected by vaccination. Recent cases that have come under our

observation would scarcely justify us in making any definite statement along this line, other than to say that the mortality was very materially reduced when the animal contracted the disease between the first and second vaccination, and practically reduced to zero when vaccinated sufficiently long before exposure to infection. Senator Dulaney, of Issaquena county, vaccinated at the beginning of the epidemic his 300 levee mules and had lost none when we last heard from him. J. P. Alexander & Co., of Harward, Ark., vaccinated, we were told, mules and cattle, 400 in number, and lost none. Graves & Vinton Cotton Co., of Memphis, Tenn., own five plantations, three in Mississippi, one in Louisiana and one in Arkansas. About 250 mules work these places and all of these mules were vaccinated last April. So far as we could learn none of them had died. That this company believes in vaccination is shown from the fact that they compel their managers to vaccinate all their mules every spring before time for anthrax to appear. The Delta Banking and Trust Co., of Vicksburg, owns a large plantation, the former Richardson estate, at Dahomy, Miss., on which they had 400 mules vaccinated in June after charbon had appeared in the neighborhood. Fourteen mules in all died, but none after the vaccination had time to render them immune. Vaccination against charbon is certainly a cheap insurance against the disease when carefully made early in the season with good virus, freshly prepared. The essential points to be observed are to thoroughly cleanse the hypodermic syringe, needle and skin at the point of injection and to follow to the letter the printed instructions accompanying each package of virus.

Anthrax vaccine virus can ordinarily be obtained from wholesale druggists in Memphis or New Orleans. The vaccination consists in inoculating with two lymphs of different strength at intervals of five or ten days. When ordering the virus send for a hypodermic syring- and needle for making the inoculation. About ten days after making the second inoculation the animal should be immune to charbon, but prior to this time experience has shown us that he may contract it. Every year animals in permanently infected districts should be vaccinated about the middle or first of April.

4. Disinfect the premises, burn all the trash around the barn, destroy the feed and watering troughs by fire, and change the feed if it appears to be the source of infection. If stall has a dirt floor it is well to excavate it three or four inches and burn or deeply bury the dirt. Wash sides of stable, blankets, harness and everything that has come in contact with the diseased animal with some disinfectant,

such as chloride of lime (one pound to four gallons of water); or crude carbolic acid (one pint to one bucket of water). In a few days whitewash stable well, and do not use for several weeks.

Medical Treatment.—But little encouragement can be given along this line. In many outbreaks medicine seems powerless, as the course of the disease is so rapid that the victims die before any treatment can take effect. No specific for this disease in its severe type has, so far as we know, ever been discovered. Open the system with some purgative, say one pint of linseed oil or one pound of sulphate soda, which may be combined with fifteen or twenty grains of calomel. Paint the swelling with compound tincture of iodine or some strong liniment. In addition to this some have claimed success in treating the disease with the following mixture: iodine crystals one ounce, potassium iodine two ounces, pure water twelve ounces. Mix well and give one or two tablespoonfuls of the mixture in a quart of water every three or four hours. Do not bleed the animal, as this only weakens him and makes him more subject to the influence of the virus. After handling animals with anthrax we should wash our hands well with some strong antiseptic.

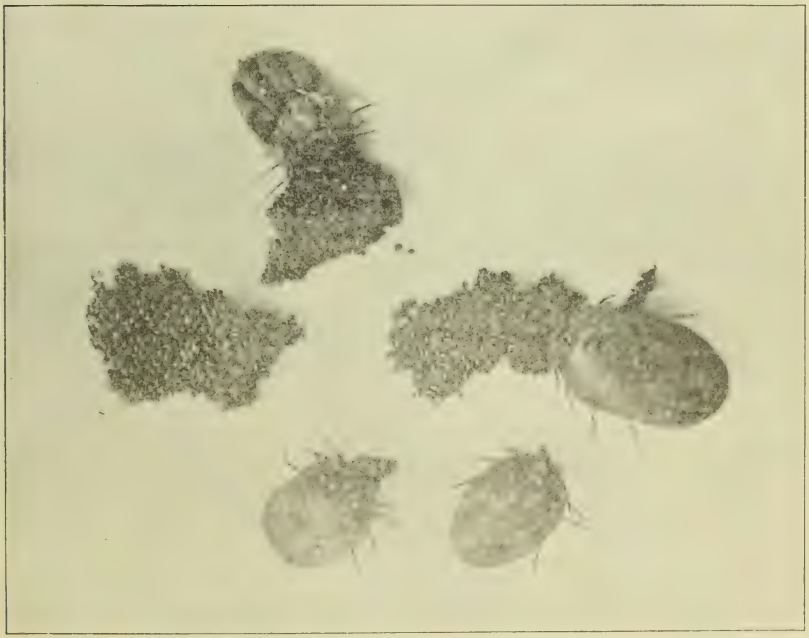
Mississippi Agricultural Experiment Station.

BULLETIN No. 73.

TICK FEVER OR MURRAIN IN SOUTHERN CATTLE.

(COMMONLY TERMED TEXAS FEVER)

By J. C. ROBERT.



Cow Ticks (the carrier of the Tick Fever germ) laying eggs.
(One and one-half times the natural size.)

AGRICULTURAL COLLEGE, MISS.,
JULY, 1902.

MISSISSIPPI STATIONERY CO., YAZOO CITY.

TICK FEVER OR MURRAIN IN SOUTHERN CATTLE.

(COMMONLY TERMED TEXAS FEVER.)

In order to meet the popular demand for information concerning a disease that has in past years cost the State many thousands of dollars, this bulletin is issued concerning that fatal sickness of cattle known among farmers as "murrain." When occurring in cattle brought from the North it is sometimes called "acclimation fever" and "southern cattle fever." All of these names apply to the same malady which in reality is a blood disease of cattle caused by the presence of the common cow tick.

There are about nine million dollars invested in cattle in Mississippi, and this disease, Tick Fever, is responsible for the death of more animals than that of all other cattle diseases combined. By carefully examining our cattle every few months and seeing to it that they, from the first few weeks of their life, are never entirely free of the cow tick we can prevent the many thousand dollars loss that we annually sustain. In combatting this disease, then, we have a warfare against the ticks, and in order that we may be successful we are driven to one of the two conclusions (1) we must completely exterminate the cow tick from our state (this we do not believe at present to be practicable), or (2) we must keep a few of them constantly on our cattle. Eight species of ticks have been reported as found on cattle in the United States. These are chicken tick, ear tick, American dog tick, European dog tick, castor-bean tick, lone-star tick, net tick, and cow tick, but none of these are found to any marked extent upon cattle except the last named, and so far as has been determined none except the cow tick carry the germ of the disease.

History of the cow tick.—This parasite is too well known to southern farmers to need an introduction. The half-tone on the title page of this bulletin shows four female cow ticks laying eggs. The male tick is quite small, not larger than the head of a pin of ordinary size, and as a rule may be found attached to the skin of the animal just beneath the female. The female grows much larger, as

shown in the illustration. When fully grown she falls to the ground, and in from one to three days in summer begins laying eggs. We find that each mature female may lay from 1200 to 3000 eggs. The time required for these eggs to hatch will depend upon the temperature and moisture surrounding them. During the month of July we have hatched them in the labatory in 14 days. In the fall they require from four to six weeks to hatch. When hatched the young is a minute six-legged parasite just visible to the naked eye. The eggs are hatched in clusters (after which the female dies), and the young ticks, "seed ticks," usually remain in bunches until they attach themselves to their host, the cow. After this they shed their skin in one week, if the weather is warm, and have four pairs of legs In another week's growth they shed their skin the second time and become sexually mature. Mating now takes place. The development of the eggs within the female and engorgement with blood causes her to increase materially in size. Within a few days she falls to the ground begins laying and then starts a new generation.

After ticks get on the cow about ten days pass before we notice that the cow is sick. Sometimes death results in from 24 to 36 hours from time the first symptoms are seen. In such a case the ticks would not have molted the second time and would necessarily be very small and escape notice unless we make careful examination for them. Indeed, in some cases I have had the animal skinned, the hide hung up in a good light, and made the most careful search, by turning the hair up, before finding numerous minute ticks.

The effect of water upon the hatching of tick eggs.— To Prof. H. A. Morgan, of the La. Experiment Station, are we inindebted for the most valuable contribution that has yet been made (see bulletin No. 51 Second Series, La. Expt. Sta.) concerning the effects of natural surroundings upon incubation of ticks. Prof. Morgan placed tick eggs upon potted earth and sprinkled them daily with water from August 15th "until the earth even was puddles and the eggs were in part submerged." Sept. 1st hatching began and all eggs hatched in same time as those of a check experiment which received only the moisture of the soil upon which they were placed. From this experiment it seems that tick eggs might wash from one pasture into another and then hatch.

The effect of light upon incubation.—Prof. Morgan of La. and Dr. Dinwiddie of the Arkansas Experiment Station call at-

tention to the fact that tick eggs exposed to the direct rays of the sun would not hatch. With one lot of eggs, I have had some experience. Eggs shaded from the direct rays of the sun and those kept in the dark hatch readily with proper moisture and temperature. This probably accounts for more ticks being found in woods than in open pastures.

The effect of cold upon the incubation of eggs.—Under natural conditions hatching of tick eggs becomes arrested very early in the fall. We have had eggs deposited in November and carried them through the entire winter without hatching. Prof. Morgan says: "Eggs deposited on the 25th of October have gone through the winter unhatched. Their fertility was tested by hatching a few of the same batch in an incubater. Some of the eggs under hibernating experiment did hatch during protracted warm spells, yet this was rather the exception.

Eggs layed on December 7th, placed in an ice freezer at temperature of 15 degrees F. for twenty-four hours, then removed to an incubator at a temperature of 95 degrees F., hatched on January 14th." It is seldom that we have in the central and southern part of our State a temperature of more than 10 or 15 degrees below the freezing point and besides many tick eggs are deposited under organic matter that protects them.

The effect of water upon seed ticks.—Lightly spraying bunches of seed ticks was found to have no marked effect upon them. When they were placed in water they floated as long as they remained together. One instance is mentioned where two individuals remained attached and floated upon the surface of water for three days. Prof. Morgan found, however, that as soon as ticks were separated in water that they were drowned. It is not surprising, then, that our alluvial pastures become free of ticks in many cases.

Effect of cold upon seed ticks.—It has been found that lowering the temperature to 15 degrees F. for 24 hours will kill seed ticks, but a temperature of 16 degrees F. for 24 hours followed by a temperature of 70 degrees F. caused them to again show signs of active life.

The effect of rainfall upon adult female tick.—The seed ticks in every way seems to possess greater vitality than does the grown female. If placed in water sufficiently deep to cover her

body the adult female at once drowns. This being the case we will readily see why it is that overflowed and level lands at times become entirely free of ticks.

Effect of cold water upon adult female ticks.—A temperature of 20 degrees F. for 24 hours has been found to kill all adult females. Most of the ticks that survive the winter do so as eggs and as seed ticks. The U. S. Department of Agricultural recoginzing this fact allows us to ship cattle north for sale only between the 15th of November and the 15th of February.

How long will ticks live without food?—The longest time that we have been able to keep them alive is about three months. Prof. Morgan succeeded in keeping them without food from September 14th, 1897 until January 26th, 1898, about four and one-half months, and during warmer weather about two months,—from July 20th, to September 15th. Dr. Schrœder, of the Department of Agriculture at Washington, collected a number of female ticks February 3rd, 1897. Eggs from these had hatched by March 11th, and many of the seed ticks remained alive until July 21st,—four months and ten days—when they were placed upon a cow. A number of these were matured by August 13th, when they were collected. We thus see that these ticks remained alive more than five months. If we suppose that tick eggs can retain their vitality five and one-half months and the seed ticks live five and one-half months without food before dying, we see that eleven (11) months would be the maximum time that a pasture could remain infested after removing all cattle. In this estimate, however, we make no allowance for their chances of being killed by cold, sunlight, and heavy rains.

Where are cow ticks not found? (1) It is well known that the U. S. Department of Agriculture, recognizing the poisonous properties of the cow tick, has established a rigid quarantine line running from the Atlantic to the Pacific Ocean north of which the cow tick is not supposed to be found. This line runs just north of Mississippi and includes to the south of it eight or ten counties in Tennessee.

(2)—There are many farms all over our State that are free of ticks. Recently I wished to vaccinate some imported Hereford cattle in Marshall county and was unable to find a tick infested native cow in the neighborhood from which to draw the blood. Upon further examination I was told by some parties that they had not seen a cow tick during the summer within a radius of five miles of that place.

I do not think I am wrong in estimating that fully one-half of the townships in our counties that border on Tennessee are free of cow-ticks. The same is true to a less extent of many of the counties south of these. We have made observations in Panola, LaFayette, Pontotoc, Union, Lee, and Prentiss counties and know that in them it is by no means uncommon to find tick-free districts. In the northern part of the State we attribute this to the fact that the temperature gets low enough to destroy these parasites.

(3)—Cow ticks are never found in a field that has been cultivated since occupied by tick-infested cattle, since plowing up the land destroys all ticks and tick eggs. The cultivated lands of the State includes a large area.

(4)—Pastures and woods that have not been occupied by ticky cattle for twelve months will be free of ticks. Much of our pasture lands are used longer than a year by horses, sheep and other live stock.

(5)—We have seen that water, on overflowed lands, kills mature female ticks, kills and washes away seed ticks, and washes away tick eggs. Much of our State, including the Mississippi bottom lands, and, certain prairie regions are thus freed of ticks.

(6)—Small lots around towns are usually free of ticks since they are closely grazed and the direct rays of the sun prevent tick eggs from hatching.

Must every animal belonging to the bovine (cow) family have Tick fever?—Every bovine animal, native, or imported, belonging to the beef, dairy or general purpose class, of every size, age and kind must and will have Tick fever when they are first infested by virulent cow ticks.

Will a calf from a Native Southern Cow have Tick fever when infested by cow ticks, where his mother has had the disease and become immune to it?—He will in every case and the fact that his mother has had the disease does not make the disease any milder for him. We cite the following experiment that is of interest in this connection :

A registered Jersey calf (No. 76) dropped in a tick-free pasture, and No. 75, were both out of native cows (Nos. 73 and 74). These cows were proved to be immune to Texas fever. They were free of ticks, however, were kept on a tick-free pasture, and their calves

(Nos. 75 and 76) were allowed to suck them. On April 1st, 1901, when No. 76 was four months of age, we drew about half a pint of blood from his jugular vein, defibrinated it and with it immediately vaccinated two northern cattle. These northern cattle were from a lot that we imported November 1900 and kept free of ticks. No. 52, a grade Hereford cow about 8 years of age, received, on April 1st, 1901, subcutaneous injection of 25 cubic centimeters of blood from No. 76. The temperature of this Hereford cow was taken daily for more than a month but she did not show the slightest fever. On the same day, April 1st, we vaccinated No. 60, a grade Hereford northern calf about six months old, with 10 cubic centimeters of blood from No. 76. The temperature of this calf, like that of No. 52, was recorded daily for about five weeks but no fever developed. The red blood cells of these cattle remained normal through this period. On April 15th, the red blood cells of No. 52 were 7,790,000; on April 29th, 6,430,000; on May 3rd, they numbered 7,430,000; on April 17th, the red blood cells of No. 60 numbered 9,470,000; on April 29th, they numbered 8,780,000; and on May 3rd, 9,260,000. We thus see that neither of these northern cattle contracted Texas fever from this vaccination, which fact proves the non-existence of the Texas fever germ in that calf No. 76. On April 15th, we vaccinated this calf with 2.5 cubic centimeters of defibrinated blood taken from No. 61 (a full blooded Angus heifer that we brought south in November and rendered immune to Texas fever by vaccination). On April 16th, No. 76 showed by the hæmatocytometer 9,830,000 red blood cells, and at 9 A. M. had a temperature of 101.9 degrees F. The first rise of temperature occured on April 22nd, when it reached 102.7 degrees; on the 24th; at 9 A. M. it was 104 degrees and his red blood cells numbered 5,710,000; on the 25th, his temperature registered 104.8; on the 26th, 105.5; on the 27th 103.4; On the 29th, 102.2. and on May 3rd, 101.7 with red blood cells numbering 5,700,000, which is more than 4,000,000 less than those recorded on April 16th.

On May 3rd, 1901, we for a second time drewr blood fom No. 76 and revaccinated Nos. 52 and 60 with 25 cubic centimeters and 10 cubic centimeters respectively of his blood, as was done on April 1st. From this vaccination we get very different results. On the day of vaccination, May 3rd, No. 52 had 7,430,000 red blood cells and at 12 M. her temperature registered 101.8 degrees. At 4 P.M. on the 6th, three days after vaccinating we turned this cow with No. 60 and several others into a large and better pasture, one that had been

occupied by native cattle. At 9 A. M. on the 8th, five days after making the vaccination her temperature was 102. At 6 P. M. on the 9th, it rose to 105.4 and remained high until death which occured the night of the 15th, twelve days after the vaccination. On the day before her death the red blood cells numbered 2,600,000 and temperature was 106.2 degrees F. at 8 A. M. On the day of revaccination, May 3rd, the blood cells of No. 60 numbered 9,260,000. On May 10th, 9 A. M., just seven days after vaccination, her fever rose to 102.9 degrees; on 12th, 8 A. M. temperature 103.0; 13th 103.8, 14th, 103.6 and red blood cells 7,930,000; 15th, 104.0; 18th, 106.6 and red blood cells 4,680,000; on the 19th, 106.2. She now began to improve but became infested with ticks before she had recovered, hence, a relapse which resulted in death on June 30th. On May 23rd, her red blood cells numbered 6,970,000; May 29th, 7,660,000, temperature 107.6 degrees, and one tick three weeks old and one about ten days old found in flank and thigh; on June 30th, a few hours before death, the red blood cells numbered 4,340,000 and temperature 104.6 F.

From the above experiment we conclude that No. 76 had not the slightest poison of the disease in his blood before we vaccinated him. After vaccinating him, however, he had well developed symptoms of Tick fever and his blood was then poisonous to cattle that it before failed to infect. A gentleman, living in Kosciusko, Miss., tells me of accidently getting ticks on his milk cow that he kept in a lot in town. The cow was about a month advanced in pregnancy at the time. She had a very bad case of Tick fever, showing even bloody urine, but recovered. All of the ticks were apparently destroyed. She carried the calf (a Hiefer) to full term. The calf grew to be 18 months of age before she was known to have ticks on her and then died of Tick fever.

Are all cow ticks poisonous to non-immune cattle, and of those that are poisonous do they possess their poisonous properties to the same degree?—This is a question concerning which little has been written. All cow ticks are not poisonous to non-immune cattle. Young ticks from a female that has been raised on a horse will not produce Tick fever in cattle. We are of the opinion that the poisonous properties of all cow ticks are in inverse ratio to the time that has elapsed since the mother tick left its infected host and the young tick infects its non-immune host.

In the Sixteenth Annual Report of the Bureau of Animal Industry (pages 33 to 38) Doctors Schrœder and Cotton express the opin-

ion that young calves are immune to Tick fever. These writers also think that they have raised cow ticks free of poisonous properties (The Texas fever germ) by growing them on a young calf. Their experiment was as follows: Field A contained tick infested southern cattle, field B was on somewhat lower ground in which a young bull calf, No. 6, prematurely weaned, was confined. The two fields were separated by two parallel lines of fence about 10 feet apart, but in some way (seemingly accidental) the ticks spread from field A to field B and infested calf No. 6. Mature females were collected from him, a new generation hatched, and he was reinfested December 26th. From neither of these tick infestions did he show sign of Tick fever. After this a non-immune cow and calf Nos. 33 and 34, raised a succeeding generation of ticks without being diseased. Later at least a dozen more cattle were infested with the ticks without developing Tick fever. Eggs from female ticks raised on No. 33 were hatched and ticks placed on a southern infected cow No. 2. Female ticks were collected about July 15th, from No. 2, young ticks appeared August 22nd. On September 1st, No. 50, a two-year-old vigorous non-immune cow, and No. 52, ten year old non-immune cow, were infested with these ticks, both had well marked cases of Texas fever, and No. 52 died. One of the conclusions they drew from this experiment is "That we succeeded in our efforts to obtain a stock of southern cattle ticks which can be grown on succeptible cattle without producing Texas fever. This was done by growing ticks on a very young calf, young suckling calves evidently being wholly immund from Texas fever". That young suckling calves are not immune to Texas fever is evident from numerous experiments and records we have made with both northern and southern calves, some of which records we detail in succeeding pages. We have recorded a case of Texas fever in a calf even eight days of age (see page 233 of the proceedings of the A. V. M. A. for 1901).

Almost without exception every case of Tick fever that has come under our observation late in winter and early in spring has been of milder than ordinary type, which fact we attribute mainly to the poison of the disease remaining a long time out of the body of the cow, as the tick eggs materially require a long while at that time to hatch. In the hottest weather of summer ticks seem to be more virulent and deadly in their work when applied to non-immune cattle. Of course we must not lose sight of the fact that cool weather on the one hand favors the animal and hot weather depresses it.

The effect of a few ticks on young calves.—The constitution of young calves offers far greater resistance to Tick fever than does that of the matured animal. In most cases, such as usually occur in our southern calves during their first spring and summer, the symptoms ordinarily escape our observation, as a decrease in the number of red blood cells alone, occurs without any noticeable fever. We cite as an example No. 75, a native Jersey calf already alluded to, kept on tick-free pastures until five months old. At that time, February 19, 1901, we vaccinated him with 2.5 cubic centimeters of warm blood taken from the tick-infested native cow. In young calves this has practically the same effect as applying a few ticks. At 8 A. M. on February 27th his temperature was 103.1 degrees F. At 3 P. M. the same day it was 105.3 and the red blood cells numbered 7,020,000 per cubic millimeter of blood. His tempetature was taken once or twice daily and showed his fever gradually declining. On March 4th 4 P. M. temperature 104.8 red blood cells 4,540,000 per cubic millimeter; March 9th red blood cells 3,990,000, temperature 103.4. The red blood cells now increased rapidly; and on March 27th they were 9,950,000. During this entire time but for the use of the thermometer or the instrument used for counting the red blood cells we could not have told that the calf was sick.

We would also mention No. 96, a native grade short-horn calf, five months old, that became infested with ticks about October 10, 1901. On October 25th he had a temperature of 103.2, and red blood cells 3,270,000 per cubic millimeter of blood, but the calf showed only slight outward symptoms of fever. Numbers 31, 32, 33, 34, 35, 36, 37 and 38 were calves from three to six weeks old that were brought from the North (where cattle ticks are not found), placed upon native cows, and became tick infested without showing outward symptoms of the disease.

Number 71 was a full blooded Aberdeen angus bull calf dropped February 2, 1901. At three and a half months old tick infestion caused fever that at one time reached 106.4, and he lost more than 2,000,000 red blood cells per cubic millimeter of blood. Number 72, a full blooded Aberdeen angus calf dropped June of the same year passed through an attack of the fever by virtue of vaccination. Her fever rose to 104.8 and red blood cells reduced from 9,000,000 to 3,030,000 per cubic millimeter, but she showed no extermal symptoms of the disease other than slight weakness.

We could mention many other similar cases but we think it un-

necessary in order to prove the effects of ticks upon young calves. Many persons have noticed in spring and summer among a lot of tick infested suckling calves that some appeared slightly feverish, weak, and would fall off in flesh, such cases of early tick infestion resulting in immunity are not uncommon.

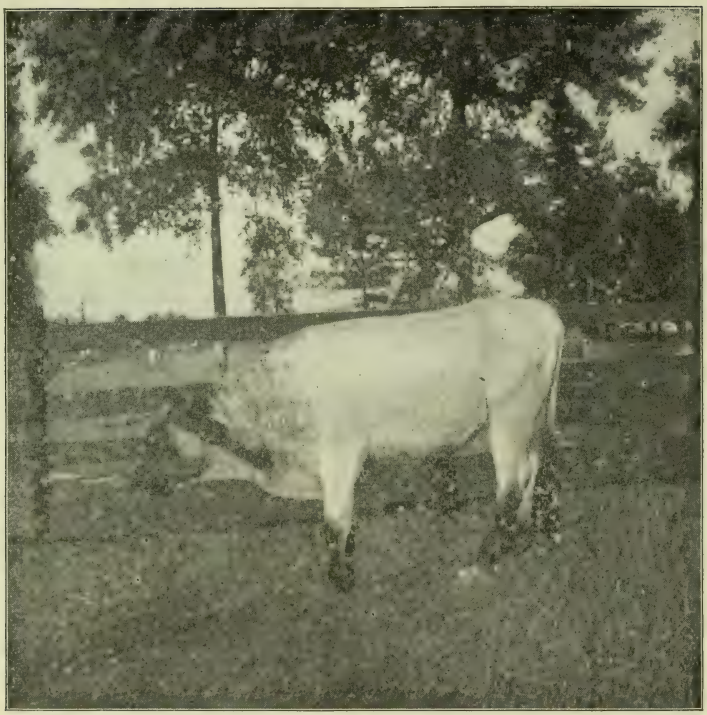
The effect of many ticks upon young calves.—Numerous ticks on young calves are injurious (1) on account of the amount of poison with which that at one time infects the animal and (2) by virtue of the great amount of blood abstracted from the body. Many cases of death from Texas fever occur in young animals under a year old. No. 68 of our experiment, a grade angus native calf, was dropped Dec. 1, 1900. He was kept at night in a small inclosure that, so far as we could tell, was free of ticks. During the day he was kept on a pasture upon which we found none of the parasites. About June 15th he was placed in a large pasture with a number of ticky cattle. On June 28th he was found down in the pasture with high fever and rapid respiration, and had on his body numerous small ticks. He had lost some flesh, had grown quite weak and would rise only when made to do so. The owner gave him a dose of salts, scraped off all the ticks that he could, and then oiled him and left him in the pasture. I first saw the calf on June 30th at which time he was lying down. He had lost flesh and was quite weak ; his temperature had been reduced to normal but his pulse and respiration were rapid. Upon counting his red blood cells I found that they had been reduced from the normal (which I find a calf of his age to be about 7,000,000 per cubic millimeter of blood) to 2,470,000 per cubic millimeter. Thus we see he had lost about five-sevenths of his blood corpuscles and was necessarily very much weakened. On July 6th his blood cells were 2,940,000, his temperature registered 105.7 and he was quite thin. I did not see him after this time but he continued to grow worse, he got down, was unable to rise, and the owner had him killed on July 15th.

No. 60 (that we refer to later) was a grade Hereford northern calf, 7 months of age. On May 3rd 1901 this calf was vaccinated with 10 c. c. of blood from No. 76 (already alluded to) that had been infected with Texas fever germ. This gave rise to fever that reached 106.0 on May 18th and a reduction of red blood cells from 9,260,000 on May 3rd to 4,620,000 on May 18th. The calf now began to improve, the temperature was normal May 25th and on the 29th red blood cells had increased to 7,660,000 per cubic millimeter of blood,

but she became tick infested before recovering from the vaccination and on June 30, 11 A. M. temperature was 104.6 red blood cells 4,340,000 and died that night.

Numbers 46 and 48, registered Jersey calves about 8 and 10 months of age were, during the summer of 1900, purchased from a stockman at Honeygrove, Texas, and brought to Adams county, Miss. They were placed in a dairy herd that is kept upon the hills in the vicinity of Natchez where ticks are plentiful, and these when seen by me on Sept. 23rd, 1900 had typical cases of Texas fever. On September 30th 1901 we received a telegram to visit, if possible, another fine dairy herd at Meridian, Miss. When we arrived we found a registered Jersey calf four weeks old quite sick, and one five months old recovering from sickness. The neck, thighs and flanks of these calves were literally covered with ticks from ten days to three weeks old. Under proper treatment both recovered from the fever. The older of these calves had had a bloody urine. One calf about six weeks old had died, the herdsman said of the same disease. There is no question in my mind but that the calf died of Texas fever. All three of these calves were from native cows.

The effect of a few ticks on cattle over twelve months of age.—Young cattle that pass the age of one year before coming in contact with a small number of ticks withstand their poisonous effects better than do old cattle under the same conditions. This fact is borne out by every observation that we have made, and advantage is taken of the fact by stockmen in importing valuabe young cattle into the South from north of the "cow tick quarantine line," (Texas fever line.) Young cattle not only withstand ticks better than do old ones but they better endure vaccination against the fever. This vaccination in cattle under 12 or 18 months of age if properly performed furnishes results in immunizing as good as, and possibly better, than mild tick infection since all cow ticks have not the same poisonous properties. Nos. 28, 40 and 44, three native steers that belonged to the Experiment Station, during their first summer were on tick infested pasture but an effort was made to destroy all the ticks by oiling the cattle and it was not known whether they got ticks on them or not. During the next summer they became infested with ticks and developed a serious type of the fever but recovered. No. 41, a steer, became much emaciated, with red blood cells reduced to 3,400,000 per cubic millimeter of blood, recovered.



Native Steer (No. 44,) recovering from Tick fever.

We will refer to only one more case, that of a registered short-horn bull, No. 99, belonging to a Mr. Watson of Holmes county. This bull was purchased from Illinois and brought to Mississippi when about one year old. Mr. Watson tells us that so far as he knows he had no ticks on his farm when he purchased the bull, and had none there until he purchased some ticky cattle four (4) years after importing the bull. The bull contracted the fever shortly after running with the ticky cattle—four years after coming to Mississippi. When we visited him October 26th, 1901, his temperature was 103.3 F. and red blood cells numbered only 3,670,000 per cubic millimeter of blood.

The effect of large numbers of ticks on cattle that have passed the age of 12 or 18 months before being infected by them.—These cases usually result in death, and losses to our State from cattle of this class amounts annually to many thousands

of dollars. I mention below a few of the many cases that have recently come under my observation. Nos. 39 and 40, native milch cow on the same pasture which became infested with a large number of ticks, developed a typical case of the disease, and died after a few days sickness. Post-mortem examination of these cases showed the characteristic lesions of Texas fever. No. 29, an eighteen months old heifer, and No. 42, a young cow, both in the same pasture, died the same evening. We held autopsies the following morning, which confirmed our diagnosis. Among the other characteristic conditions we found the urinary bladder of each of these two filled with blood red urine. So far as we could learn none of these four mentioned had had ticks on them previous to their sickness. Three of the four were kept until about one year old in a small lot and then in pastures that seemed to be tick-free until shortly before they became sick. The fourth, No. 42, was an especially finely bred animal and during her first summer she was carefully groomed and an effort made to keep all ticks off of her. All four of these had a large number of ticks on them. No. 19, a very fine full blooded Jersey heifer, purchased from a party in Yazoo City, Miss. at a price of $125.00 was raised in a herd that was kept oiled against ticks. Shortly after the purchaser got her home she became grossly infested with ticks and died in about 36 hours after being found sick. Upon post-mortem examination I found that she unmistakably died of Tick fever. Nos. 23 and 24, two work oxen, purchased from what was (as I can best learn) a tick-free farm, and placed on a farm infested with ticks. Shortly after purchased both became sick, were dull, drowsy, lost their appetite, fell off in flesh, had bloody urine and died within three days of each other. No. 25, a registered Jersey cow that seemed to be free of ticks until about time for her third calf became infested with ticks and died of Texas fever on the 12th day of her disease.

How to tell the disease, Tick fever.—First secure the history of the animal to see if it has at any previous time been infested by ticks. Then look for its ticks. They are usually found about the soft skin of the thighs, flanks and neck, but may be all over the body. The animal loses his appetite, becomes depressed, has a staggering gait, falls off in flesh, if he lives long enough, has high fever (this falls just before death,) there is more or less constipation that may be followed by diarrhoea, sometimes bloody or wine colored urine, great depression and weakness followed in many cases by death.

Post-mortem appearance.—We give below from our note book record of a recent post-mortem examination we held on a Texas fever case. This animal, a full blooded Jersey heifer about 18 months old, was raised in the town of Starkville, Mississippi, and it was not known whether or not any ticks got on her the first summer. Shortly after turning her in a tick-infested pasture she was seen sick and on the next day was found dead. I held an examination probably not later than 6 or 8 hours after death and made the following observations: Heifer lying on left side. External appearance normal with many young ticks on thigh, udder and flanks. Small red spots on the outer and inner sides of the heart. The liver about two and a half times its normal size, edges round, yellowish, structure easily broken down. Bile duct very much distended. Gall bladder filled with gall that was thick and flaky. Spleen about two and a half or three times its normal size, with structure soft and friable. The first, second and fourth stomachs were normal, the contents of third stomach being abnormally dry. Surface of small intestine congested. Large intestine normal. The urinary bladder very much distended with dark bloody urine. Kidneys inflamed, with bloody spots on the outer surface of the left kidney. Blood throughout entire body thin and coagulates poorly.

What time of the year is the disease most common?—The natural conditions most favorable to the development of ticks, exist in the spring and summer, hence we find the disease most prevalent at that time. A protracted dry spell of weather, such as we are now having (June 15th, 1902,) is especially favorable for the hatching and growing of ticks. This sort of weather also causes the grass to become more coarse and dry, thus favoring impaction of the third stomach of the cow and lessening chances of recovery from the disease.

Is Tick fever in Southern cattle a common disease?—In my opinion it is the most common of all diseases of our native cattle and causes greater loss than all other cattle diseases combined. Scarcely a week passes in the spring that we are not called upon to treat either personally or by letter cases of Tick fever. The unfortunate thing connected with the disease is that many farmers do not know the cause of it and some of them will not believe until they have lost heavily from it. We mention below a few additional evidences of our losses from the disease:

A gentleman living at Batesville, Panola county, Miss., tells me

that three years ago he purchased 400 head of cattle. They were purchased from different parts of that, and, I think he said, adjacent counties. Many of them had no ticks on them, some of them did have ticks. They were all placed in the same pasture and 100 or 25 per cent of them died of fever. Many of these had bloody urine.

Capt. L. D. McDowell, one of the most successful stock raisers of this (Oktibbeha) county, had to appear on his stock farm on the 29th of last August a fatal disease among his registered Jersey cows. At the time of its occurence I was away from the College so did not get to see them. There is no doubt in my mind, however, nor in the mind of Capt. McDowell and others who saw them, that the disease in question was tick fever. By permission, I give the occurrence of the disease as related to me. Four years previous for some cause ticks entirely disappeared from the farm. (I think it likely that this was due to rotation of pastures—keeping the horses on that occupied by the cows, and vice versa.) No ticks for four years had been upon the farm. On about the last of July a neighbor was allowed to place two ticky cows in with the herd of twenty cows. Five cows, four years old and under, died, each showing bloody urine and other symptoms already described. One young bull sent away from the place about the same time, got ticks on him and died, The cows that died had young ticks on them. It is interesting to note that none of the 12 or 15 cows over four years of age died. They were constantly kept on the farm during the four years since it had been infested by ticks, and this would indicate that they, after four years, had not lost their immunity to the disease.

A physician living in an adjacent county has made it a practice to buy young cattle in the spring, grazing them on his rich prairie pastures, feeding them in the fall and selling them in the winter. Many of these yearlings had not been raised in pastures but were constantly staked out in the cultivated field by their negro owners. This gentleman tells me that within one season he lost over $500.00 worth of young cattle from red water, or, Tick fever.

A party running a creamery upon an upland farm at Greenville, Miss. had an opportunity to purchase very cheaply thirty head of milch cows from an overflowed farm twenty-five miles down the river. The purchase was made, the cows boated out, placed upon a dry, tick infested pasture, and this resulted in twenty-eight out of the thirty dying of Texas fever.

Only last week I was requested to go to a stock farm in Lowndes

county to see some sick cattle. When I reached the farm I found the pasture infested with ticks, some of the cattle dead, others dying, and some that were beginning to show symptoms of Texas fever. The owner of these cattle gives me the following data: Number of cattle he had in pasture, 51, including 42 purchased since December, 1901. Twenty-two of the forty-two were purchased in January, ten of these were known to have been purchased directly from a tick infested pasture, 12 of the 22 were bought from different parties and it was not known whether or not they had come in contact with ticks. Four of these twelve became sick, one died. The remaining 20 of the 42 cattle were purchased this spring and summer from negroes and other parties who had no ticks in pastures. Thirteen (13) of these 20 have died, the remaining seven (7) are now sick. Not a one of the cattle raised on the ticky pasture has been sick.

We give below copy of a letter similar to many we receive.

DEAR SIR: "I have several very fine Jersey heifers. One has died, another is sick.

A neighbor has lost several two-year-olds.

SYMPTOMS: For a day or two they seem "droopy," if you will excuse the expression. They have fever, breathe rapidly, and unsteady in gait and after being sick two or three days drag toes of hind feet. They cease to ruminate. However, they eat a little, drink some and walk about occasionally up to the day of death.

They stand with heads lowered and ears drooping. Ears warm. The excretions continue, but decreased of course. About last day, urine is bloody. Disease runs its course in four to six days.

Please help us out with diagnosis and remedy. They have fed on bermuda pasture and had teosinte and well water."

From the preceding it is readily inferred why Tick fever is so common in this State. I should further say that cattle that have been raised on pastures burnt over frequently as well as those that have been oiled are also liable to the disease.

Cattle buyers should be careful as to their purchases.—I have seen so many heavy losses from Tick fever that I do not want to leave this subject without urging our stockmen to be extremely careful as to their purchases. The ticks are the best certificate that the cattle can have as to their immunity to the disease. Do not purchase them unless they have ticks on them or unless you are certain that they have previously had them on their bodies.

What shall the stockman do who has cattle and no ticks on them?—This is a question that I feel a delicacy in an-

swering. So long as you keep them free of ticks, you need have little fears of their contracting the disease (the U. S. Department of Agriculture records one or two cases where flies carried infected blood from an immune to a non-immune cow and caused the disease.) But the risk of keeping tick-free cattle in Mississippi is too great unless one's neighbors agree to work with him to that end. In such a case as above I would vaccinate all my young cattle—those under 18 or 24 months of age, and dispose of my grown ones in one of three ways; (1) kill or sell them for beef, (2) vaccinate, carefully watch and nurse them, and let them take their chances for recovery, or (3) place them to themselves and give them special attention to see that they get no ticks on them, in case they are valuable breeding animals.

How to perform vaccination against Tick fever.—The vaccination is simple, consisting only in injecting blood from a tick-infested native cow into the uninfected animal. It is not essential that the cow have ticks on her body at the time we draw the blood, for the Texas fever germ will live for months in the blood of cattle, but we should at least be sure that the animal has been infested recently. We prefer that the cow (from which we extract the blood) have ticks on her, we are then sure that her blood will infect the animal viccinated. Vaccination is preferable to tick infection because we can thus better regulate the amount of virus used.

In order to make this vaccination there is needed (1) a tick-infested cow, (2) a knife with sharp blade, (or better, a fleam) to open the jugular vein, (3) a cup to catch the blood, (4) a hypodermic syringe (holding at least one-half fluid dram) with which to make the injection, (5) a pair of scissors, (6) one or two pins to close opening in jugular vein and a string to tie around same, and (7) a 3 per cent watery solution of carbolic acid. The above mentioned instruments should be sterilized by placing them in cold water and boiling for one-half hour.

Secure the cow with a long rope either fastened around the horns or made into a halter. Pass this rope around a fence post with the left side of the cow to the fence. Bring rope over right side of cow, pass the end around first post to rear of cow and give it to an assistant to hold. In this way the cow is held firmly against the fence. Tie a short rope around base of the cow's neck so as to compress and distend jugular vein. Clip hair over the vein with the scissors, wash the skin at this point with some antiseptic (as 1 part of carbolic acid to 30 parts of water) and have another assistant place hand over

cow's eye. Open vein with fleam or knife, catch blood in cup and, with hypodermic syringe and needle inject it beneath skin of the neck of animal to be vaccinated from one-half to one fluid drams for the first injection, and one and a half to three fluid drams for the second vaccination. The point of injection should be carefully washed with the antiseptic.

In from 5 to 12 days after the vaccination the temperature of the animal vaccinated rises to 103 or 104.5 degrees F. Sometimes it runs as high as 106 or 107 degrees. This fever goes down as a rule in from 4 to 7 days to normal (in the cow from 100.5 to about 102.5 degrees F.) In about four weeks after the vaccination a secondary fever occurs. This is due no doubt to hatching out of a very large crop of germs from those inocculated. This secondary fever is not as a rule as high as that first observed, and it usually declines in less time. In some cases we have had this secondary fever has proven more severe than the first. At the end of the sixth or seventh week from first vaccination they have usually entirely recovered from its effects and should be vaccinated the second time. The second vaccination usually results in less fever than the first one. In cases of valuable breeding animals past 14 or 16 months of age we prefer vaccinating them a third time. After entirely recovering from the second or third vaccination a few ticks should be placed upon the animal at which time he should be able to stand them with little inconvenience.

Precautions.—During the entire vaccination period the animal must be kept on a tick-free pasture (made by plowing, cultivating or burning off.) Through all of the fever period the young cattle must have nourishing laxative food, if possible have green patches for them to graze upon. Careful attention must be given to the diet at this time for insufficient food or constipating foods may result in the death of the animal.

We should keep our native cattle immune to Tick fever by placing a few ticks upon the young calves.—As already indicated calves during the first months of their life withstand Texas fever better than at any other time, hence every southern farmer should be sure that his calves get ticks upon them during their first season of ticks. To this end every farmer may keep a few of these ticks on hand constantly. This can easily be done by placing a few of the large ticks (which are females), say half a dozen, in a clean quinine bottle, close the bottle by tieing a piece of thin cloth

over it or a piece of cotton in the end. It is well to place a little dirt in bottle before putting in the ticks. In a few days these ticks begin laying eggs, as shown in illustration. Each tick lays on an average from 1200 to 3000 eggs. These eggs hatch in a few weeks in the spring, summer and fall. By placing a few ticks in a bottle every six or eight weeks we can always keep the seed ticks on hand for our young calves. When they are from two to three weeks old place from 50 to 100 on them. At 2 months of age apply 200 or 300 seed ticks.

What a prominent stockman writes about Tick fever. —When we decided to get out this bulletin I wrote to Mr. Wheatley, of Greenville, Miss., and requested that he give his experience with Texas fever. He very kindly responded at once. I was so much pleased with his letter that I asked and obtained permission to publish it. It is as follows:

GREENVILLE, MISS., June 17, 1902.

DEAR SIR: Complying with your favor of recent date I beg to detail my experience with Texas fever, or, as should be called Tick fever, in cattle.

(1) A Jersey heifer brought from the suburbs of Memphis, Tenn., in the fall of 1895 when about 8 months old. Kept in the city limits of Greenville, Miss., on my residence lot until about 14 months old when she was sent to my pasture about two miles in the country. In less than 30 days she was infested with ticks, and sick with a high fever, great depression, and urine bloody or dark in color, and died in about four days, with what was called bloody urine, bloody murrain, &c., but experience has taught me that she died of a typical case of Tick fever, generally known as Texas fever, and by some as acclimation fever.

(2) Imported from the same place at the the same time and died from the same cause two or three days later.

(3) A Jersey heifer brought from west Tennessee in the winter of 1899 when about 11 months old. Put on same pasture as No. 1. Had same symptoms as No. 1, but recovered.

(4) Cow six years old, raised in east Tennessee, brought to Como, Miss., where she remained about one year and was sold and shipped to a party in Yazoo county, Miss., where ticks are abundant. Remained there about two years. Brought to pasture described in No. 1 in September 1900. In about two weeks she became infested with ticks and died with all the symptoms of No. 1. Her former owner advised me after death that he kept his cattle greased with cotton seed oil in tick season.

(5) Cow raised in Yazoo county, Miss., by the former owner of No. 4. Brought to same pasture and at the same time as No. 4 and died with the same symptoms two days later than No. 4. She too was kept greased in tick season by her former owner. Note, she was a native.

(6) Heifer born in Ohio. Raised from four to fourteen months old on the same pasture as No. 4. Brought to my pasture at the same time as No. 4. Died

from same symptoms three days after No. 4. Kept greased by her former owner in tick season. Note 4, 5 and 6 were not kept greased on my pasture. If they had been I am sure they would never have had tick fever as grease is death to ticks.

(7) Bull calf, born in Wisconsin, brought to pasture described in No. 1 in January 1901 when about 7 months old. Inocculated subcutaneously with about 2 c. c. of blood from a southern native cow known to have been infested with ticks the previous fall. Results: calf had a rise of temperature commencing about the 8th day after inocculation which continued until the twentieth day when it went slightly subnormal, and gradually increased until it reached normal and remained there until the 27th day when another rise of temperature took place which continued about ten days and subsided. Sixty days after the first inocculation he was again innoculated as in the first instance with practically the same variations in temperature, though hardly so high. At no time was he off his feed and was full of play during the experiment. In October, 1901, he was infested with ticks but showed no signs of fever and was never sick or sorry a moment from the effect of same. Note: during the experiment he was kept on a small lot that had been plowed, and on which no cattle was kept, and which was tick free.

(8) Heifer born in Wisconsin, brought to pasture described in No. 1, December, 1901, when about ten months old, innoculated the same as No. 7 with same variations in temperature. At this time, June 17th, she has small ticks on her but shows no symptoms of being troubled by same.

(9) 10, 11 and 12 heifers born in Wisconsin, brought to same pasture as No. 8, and at the same time. Treated similarly; all have ticks; no bad results at this writing.

(13) Heifer whose dam was bought at Jackson, Miss., when carrying this heifer; infested with ticks at the same time: dropped this heifer in Jan. 1899; raised on my residence lot in Greenville, Miss., and remained there until the spring of 1900 when she was sent to the pasture described in No. 1. Soon infested with ticks, and had all the symptoms of No. 1 and died. Note, she was a native.

(14) Heifer whose dam was bought near Starkville, Miss., when carrying this calf, brought to Greenville, Miss., and kept on a city lot of a friend where this calf was dropped and raised until about 8 months old when the calf and dam were sent to the pasture described in No. 1 in June, 1900, soon infested with ticks and had all the symptoms of No. 1, but finally recovered. Note, this was a native.

Conclusions: Northern raised cattle can be kept on southern tick-free pastures without suffering from acclimatization fever, bloody urine, bloody murrain, Texas fever or Tick fever, as long as they are kept entirely free from ticks. All the above diseases are merely different names for the same disease, and are the results of infesting a non-immune animal with ticks, and should all be diagnosed and known by one name, viz: Tick fever.

If non-immune cattle are kept greased during tick season they are thereby furnished reasonable immunity, as oil is death to ticks. Native southern cattle, where raised on tick-free pastures, are not immune to acclimatization fever, etc., and will contract tick fever—the correct name—as soon as they become exposed to and infested by ticks. See Nos. 5, 13 and 14.

Non-immune stock, whether northern raised or southern natives, can be rendered immune to acclimatiztaion fever—tick fever—by innoculating with the blood of an immune as shown in No. 7.

I now see to it that all my calves become infested with ticks during the first six months of their lives and never have any trouble from them as they never get off their feed when rendered immune while still on a milk diet.

I could go on giving you many more cases that have come under my personal observation in my own herd but to my mind the above fourteen cases justify the conclusions above. With personal regards, I am, very truly yours,

GEO. WHEATLEY.

Treatment of Tick fever—Preventive.—This should be to ward off serious attacks by tick infestion, or by vaccination followed by tick infection as already described.

Curative treatment.—We know of no specific for this disease, but much good can be done by use of laxatives, tonics, good food, and good nursing. It is very desirable that we recognize Texas fever from the onset of the disease and begin at once a careful and systematic course of treatment. In the treatment of every such case there are three objects that we should have in view; first to prevent further infection by the immediate removal of all ticks from the body of the animal; second, to combat as far as possible the disease producing germs already in the system and counteract their effect by the administration of drugs; and, third, to nourish the animal throughout the entire course of the disease at regular stated intervals.

The removal of ticks is best accomplished by use of a stiff brush followed by the application of an oil to destroy all minute ticks that we have failed to see. Cotton seed oil may be used for this purpose and is best applied by means of a broom or paint brush. Oil closes the breathing pores in the skin of the tick and thus destroys them.

The medicial treatment employed in every case that has recently come under our observation, and which has in many cases proven successful consists mainly in the administration of large doses of Bisulphate of Quinine at frequent intervals until the system is well saturated with it. The similarity in nature of this disease and malarial fever led us to believe strongly in the efficiency of quinine as a curative agent in Texas fever. The plan of medicinal treatment that we have adopted in these cases has been as follows: If necessary give from one to one and one-half pounds of Epsom Salts combined with one-quarter of a pound of ground ginger in one quart of water as a drench. Following this, administer Bisulphate of Quinine in from 60 to 120 grain doses dissolved in one-half pint of water. Give the quinine

every two to four hours as long as the temperature of the animal remains above 103 degress F., then gradually decrase the dose. Should the animal grow weak it should have combined with the quinine from one to three ounces of alcohol or twice that amount of whiskey. When improvement commences the administration of an iron tonic will be found of value. We may prepare such a tonic by the use of Powdered Sulphate of Iron 2 parts, Powdered Nux Vomica 1 part, Powdered Gentian Root 1 part, Sulphate of Soda 2 parts, and common salt 4 parts, mix these ingredients and give to a grown animal from one to one and one-half heaping tablespoonfuls in feed twice daily.

Too much pains cannot be taken with nursing a case of Texas fever. The high fever incident to the disease rapidly exhausts the animal's strength and unless the proper nourishment and care is given death may result before we look for it. Give tempting, nutritious, laxative diet and pure drinking water. If the animal refuses to eat drench every four hours with one quart of sweet milk in which has been beaten 4 or 6 raw eggs.

Mississippi Agricultural Experiment Station.

BULLETIN No. 74.

SOME MOSQUITOES OF MISSISSIPPI AND HOW TO DEAL WITH THEM.

BY

GLENN W. HERRICK.

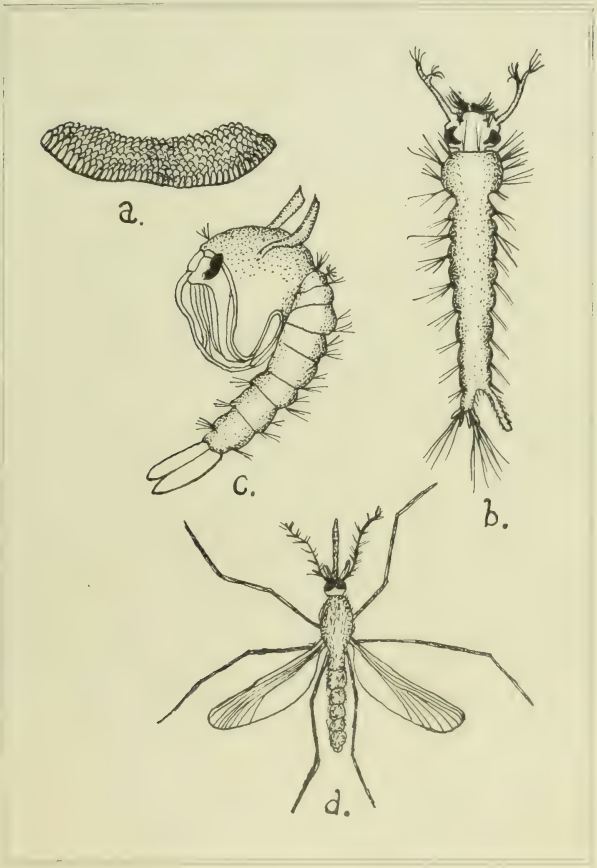


Fig. 1.—The Life History of a Common Mosquito, Culex. A—Mass of Eggs; B—Larva ("wiggle-tail"); C—Pupa; D—Adult Female.

AGRICULTURAL COLLEGE, MISS.,
NOVEMBER, 1901.

MISSISSIPPI STATIONERY CO., YAZOO CITY.

SOME MOSQUITOES OF MISSISSIPPI AND HOW TO DEAL WITH THEM.

It is not the purpose of this bulletin to give an extended account of the relations existing between mosquitoes and malaria, and yellow fever. It is rather the intention to give some account of the habits, breeding places, life histories, etc., of some of the more common mosquitoes of the State, together with the methods used in getting rid of them. From scientific researches and practical experiments, it has been demonstrated beyond the peradventure of a doubt, that certain mosquitoes inject the malarial germ into the blood of human beings, thereby causing that much dreaded disease, malaria. It has also been shown with what seems almost positive evidence, that these insects are the carriers of yellow fever, from one individual to another. Some of the proofs of the relations existing between mosquitoes and malaria, and yellow fever, will be very briefly given before entering upon the real work of this bulletin. For a more extended discussion the reader is referred to Dr. Howard's book, on "Mosquitoes; How They Live; How They Carry Disease; How They are Classified; How They are Destroyed."

Relation of mosquitoes to malaria.—How often the following sentence is seen in the advertisements of summer resort hotels: "The region in which the hotel is situated is free from malaria and mosquitoes." In the minds of the advertisers there is not an inkling of the connection between the two, yet how naturally and surely the two are always mentioned in the same breath. As though if one is absent both are absent.

It has always been common knowledge that if one goes within doors at early dusk and remains until broad daylight one is not apt to take chills and malaria. In common with this we know that mosquitoes fly and inflict their injuries mostly between dark and daylight.

Everyone knows that malaria and chills are prevalent in regions of marsh and swamp. *Now* we know that just such regions are the homes of mosquitoes. So again we have this strange connection between malaria and these insects. It is remarkable that with all this circumstantial evidence more people did not grow suspicious of mosquitoes long ago. It was not however until 1882, that the idea, that mosquitoes conveyed the malarial germ and deposited it in the

blood of human beings was forcibly put before the world. Little notice was taken of it even then, and it failed to come before the people in a convincing manner until the summer of 1900. Then it was that the Italian, Grassi, demonstrated by actual experiment that if people were protected from the bites of certain mosquitoes they could live free from malaria. Again during the late summer and autumn of 1900, two English physicians, Sambon and Low, lived in a house standing in the most malarial portions of the well known Campagna. The house was thoroughly screened so that mosquitoes could not enter. The two men during their entire stay were free from malaria and chills, while the people living outside in unprotected houses were suffering from chills and fevers. At the same time an Anopheles mosquito that had bitten a malarial patient was sent to England and there allowed to bite a person who had probably never had malaria, at least not since childhood. In due course of time after being bitten, this person developed a typical case of malaria.

Finally it has been determined that the germ causing malaria passes certain phases of its life history in a particular kind of mosquito, and certain other phases of its development in the blood of the human body. Furthermore after passing through those stages in the mosquito it is conveyed by that insect and injected into the human blood there to pass the other stages of its development, in the passing of which, malaria is produced.

Relation of mosquitoes to yellow fever.—It is too early to state anything positive in regard to the relation of mosquitoes to yellow fever. We shall simply and briefly give the experiments made in Cuba by a medical commission from the U. S. army.

In a field near Quemados, Cuba, the commission of surgeons erected a small wooden building tightly ceiled and with the windows and doors closely screened so that no mosquitoes could enter. In this house during a total of sixty-three days, seven non-immune men were kept. They used the unwashed pillow slips, sheets and blankets, that had previously been used on the beds of genuine yellow fever patients in Havana and elsewhere. Neither during that time nor subsequently did one of those seven men develop a case of yellow fever. This would seem to indicate that yellow fever is not carried by clothing.

Another house was built in this same field and divided by wire

screen from floor to ceiling into two rooms. The doors and windows of both rooms were closely screened with fine wire netting, so that no mosquitoes could enter. All bedding and material carried in was disinfected by steam. In one of the rooms, mosquitoes of a certain kind that had previously bitten patients with yellow fever, were placed. In the other room none were allowed. Non-immunes were placed in both rooms. Of those in the room containing no mosquitoes none had yellow fever. Six out of seven of those in the other room that were bitten by mosquitoes developed cases of genuine yellow fever. This would seem to indicate almost conclusively that mosquitoes of a certain kind are responsible for the transmission of yellow fever from one individual to another.

With all the foregoing knowledge concerning mosquitoes and their positive relations to malaria and their apparent relations to yellow fever, the question of suppressing these insects or keeping out of the way of them becomes a very important one to every person in the State. It has already become a question of life and death with us, and the time has come we believe, when every person should inform himself in regard to the life history, habits, and breeding places, of mosquitoes. If the experiments of the army surgeons in Cuba, demonstrate that quarantine and fumigation are useless, and that yellow fever epidemics can be controlled by controlling the mosquitoes, or by keeping inside of a wire screen out of their way, then we venture to predict that those experiments will go down in the annals of the State as the most important of the 19th Century.

The most common mosquito of Mississippi.—As far as our investigations have gone, the mosquito known as, Culex pipiens, has proved to be the most common one found in the State. We have found it in abundance in all localities in which mosquitoes abound. It is a so-called European species but has now been determined as present quite generally over the Southern States. So far as is known it neither transmits malaria, nor yellow fever, nor any other disease, to human beings. It is, therefore, of importance only because it greatly annoys man. We portray its life history and habits here, because it is familiar to everyone and thus serves as a familiar example to show how mosquitoes live. It breeds in almost every place in which fresh water may be found, in quiet pools, road side ditches, sewer ditches, hollow stumps, rain-barrels, cisterns, tin cans, watering-troughs, etc. Some instances of curious places in which the larvæ have been found will be given later.

Life history.—The life history of this mosquito is made up of four distinct stages, as follows: egg, larva, pupa and adult, (Fig. 1).

Eggs.—The eggs of Culex pipiens are laid on the surface of the water in more or less boat-shaped masses, (Fig. 2). These masses usually taper toward either end and are convex below and concave above. Hence the boat shape. In many cases coming under my observation one end of the mass is wide and rather blunt, while the other is tapering and pointed. Each mass contains from 75 to 300 eggs consequently they vary much in size, as shown by Fig. 2. They measure from ⅛ to ¼ of an inch in length and are plainly visible to the eye. The eggs stand on end in regular rows with the larger

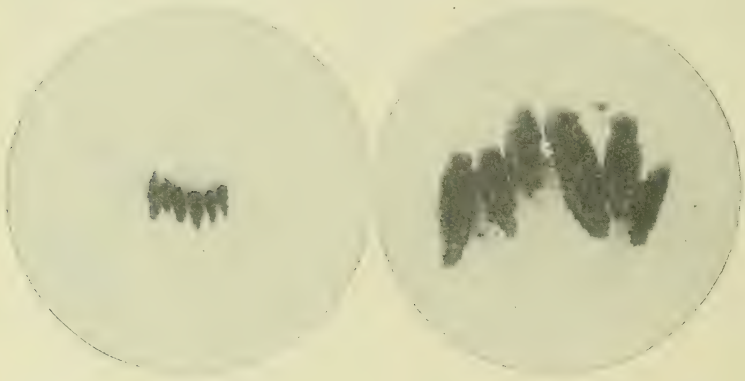


Fig. 2.—Egg-masses of Culex. At left, natural size. At right, enlarged.

ends down. When first laid the masses appear yellowish white because the individual eggs are of that color. A little later they become dark brown in color and appear as small dark objects floating on the water. The under side of the mass appears silvery white because of a film of air beneath it that prevents the eggs from getting wet. It is practically impossible to wet the egg mass. If pushed beneath the surface repeatedly, it as often comes up dry as ever. Very often where there are many egg masses on the water, several of them will run together by capillary action and form a raft of eggs on the surface. I have seen as many as six of these egg masses clinging to each other. Fig. 2 (left) shows these masses as they appeared on the water natural size. Fig. 2 (right) shows the same very much

enlarged, and also shows how the masses are made to taper at each end. The rows as they reach the outside shorten. The eggs are loosely held together in the mass and soon break apart after hatching.

Each individual egg is long and cylindrical, larger at the lower end, and tapering to the upper end. As seen from the side it resembles the blade of a knife (Fig. 3). They vary from .88 mm. to .91 mm. in length and from .17 mm. to .20 mm. in width at the base. The lower end is blunt and furnished with a cup-like frill (Fig. 3). In the center of the cup is a papilla-like projection (Fig. 3). Both the papilla and fringe, or frill, break away when the egg hatches and the young larva emerges through an opening made by a sort of lid that breaks away for its egress. In the center of the lid is what we have termed an eye-spot (Fig. 3). In looking over notes made in June 1901, it is found that in no case did the eggs hatch in less than 24 hours. Although the eggs were seen as they were being deposited it was under conditions that prevented me from noting the exact time taken to hatch them.

Fig. 3.—Eggs of Culex pipiens, enlarged.

Egg-laying of Culex pipiens.—On July 17th, in the back yard of a hotel at Magnolia, Mississippi, the writer found a pig trough five feet long, containing water to the depth of about six inches. On the surface of this water by actual count there were 257 masses of eggs of *C. pipiens*. Since there were less than five square feet of surface, one can imagine the density of egg population. It was noticed that about a dozen of the egg masses were white, or yellowish white, in appearance. This led to a more careful examination, which resulted in the discovery of a female about to finish laying a batch of eggs. Time, 6 A. M. At this time it was broad daylight and evidently all of the white masses had been laid within the hour. From repeated observations made at other times I am convinced that the eggs are laid in some instances during the night at least some time before daylight. The mosquito was so busily engaged that I could watch her with a hand lens. She rested on the surface of the water with her slender legs spread out and supported by the surface film, exactly as the water-striders or Hydrobatidæ. This is contrary to the idea heretofore held, that the female when depositing eggs, rests on some floating object. The abdomen was held at a slight angle to the surface because the caudal end was

nearly touching the surface. The mosquito stood at one end of the mass, with her head away from it. As the eggs were deposited, the mass was gradually pushed away from her. The end of the abdomen was slowly carried from side to side, so that the eggs might be placed across the end and the whole mass filled out and completed as she progressed. The process may be compared with the action of the hand as a bobbin is wound with thread. The eggs always came forth with the small end first. This end, since the abdomen was held close to the mass, would strike the other eggs and appear to be slipped along the perpendicular sides of the others, and thus be brought to an upright position. However, the tip of the abdomen was curled slightly upward, so that the egg was directed upward and very likely would have been deposited in an upright position in any case. It would have been interesting to have seen the first egg deposited. There was an appreciable interval between the deposition of each egg, perhaps two seconds, although we did not time it.

Larva.—When the egg hatches there issues from it what is known as the larva, or "wiggle-tail." Everyone that has looked into rain barrels that have stood for some time during hot weather has surely seen "wiggle-tails." These are the products of mosquito eggs. The larva of Culex pipiens rests for the greater part of the time with the tip of the abdomen at the surface of the water, and the head hanging downward at an angle of about 40 degrees. The head of the young larva is very large in comparison with the rest of the body (Fig. 4). Soon however, the thorax becomes larger. At the tip of the eighth abdominal segment is a long tube known as the respiratory tube (Fig. 5 R.) It is through this tube that the larva takes in its supply of air. This fact accounts for its position with the tail end up and the breathing tube just at the surface of the water, so that air may be drawn through it to sustain life. At the same time two dark

Fig. 4. Larva of culex pipiens, just hatched,—enlarged.

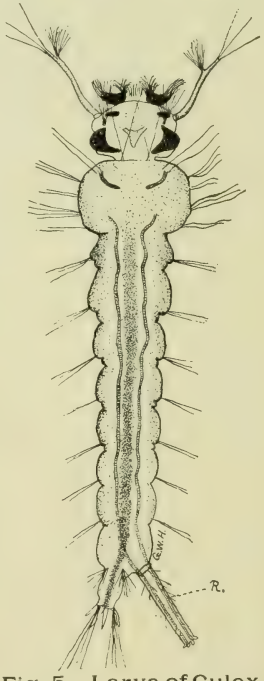


Fig. 5.—Larva of Culex pipiens, nearly mature. R.—Respiratory tube.

brushes of hairs about the mouth can be seen in constant vibration, by which currents of water are set up and food thus brought to the animal. In a jar containing many of the "wiggle-tails" some may always be seen wriggling to and from the bottom. If any one be singled out and watched, it will be found that it remains at the bottom only a very short time. This depends upon the amount of food and its availibility. That is to say, in repeated observations, I have never seen them stay at the bottom in jars containing plenty of food that they can easily get longer than one to two minutes at a time. Where there is a scarcity of food they will occasionally add a minute to this time. Like Culex pungens it is heavier than water and descends to the bottom with very little effort. In ascending it puts forth considerable effort and wriggles violently.

Dr. Howard in his observations on Culex pungens says, that "they appear to pass through three different stages of growth." No doubt the larvæ of Culex pipiens do the same but we have been unable to determine definitely. One thing however is certain; namely, that the young larvæ molt within one to two days from hatching. On the second or third day the cast skins may be seen in abundance floating on the water. Of course the time of molting will depend somewhat upon the supply of food.

The larval stage lasts from five to six days. Our entries run as follows: Eggs hatched June 5th. By noon of the 11th, there were several pupæ. Eggs hatched morning of the 24th. On the morning of the 29th there were six pupæ in jar. On morning of the 30th there were a great many pupæ in jar.

Pupa.—The illustrations show the great differences between the larva and pupa. The pupa (Fig. 6) is mostly head and thorax, with but a slender abdomen. The breathing apparatus now consists of two respiratory tubes instead of one and moreover are situated on the thorax instead of on the end of the abdomen as in the larva. As a result of the change in position of the breathing tubes, the pupa floats in the water with the head up. It is as active as the larva, when disturbed. When undisturbed it floats at the surface of the water without effort because it is lighter than water. It takes no food consequently does not need to move except for protection. When in motion downward, it wriggles violently, similar to the

Fig. 6.—Pupa of Culex pipiens, enlarged.

movements of the larva, but when ready to ascend simply floats to the top without wriggling.

At noon of June 11th, there were several pupæ. On the morning of the 13th, several adults were taken from the jar.

June 29th, there were six pupæ. On July 1st, several males were taken from the jar but no females.

This gives the pupal stage as existing from one and a half to two days.

Note that males preponderate during the first day. This was true in every case observed.

The time then necessary for the full development of a generation of mosquitoes, in hot weather, is from eight to ten days.

With these facts before us imagine how many mosquitoes might have come from that one little pig trough during the month of July.

Adult.—The full-grown Culex pipiens is a moderate sized mosquito. The wings are slightly darker than those of Culex pungens, and appear somewhat heavier, (Fig. 7). In order to be able to distinguish between this common mosquito and the malarial mosquito, it will be necessary to note in particular the appendages about the mouth. In the first place look at the figure of the head of the male Culex, (Fig. 8), and note the two feathery appendages bearing long hairs. These are the antenæ. On the other hand note that the antenæ of the female, (Fig. 8), bear only a few short hairs. The

Fig. 7.—Adult female of Culex pipiens, enlarged.

males of all mosquitoes may be known from the females by this difference, except in possibly, very rare cases. Again in looking at the head of the female Culex only one long projection will be seen running straight out from the head. This is the proboscis. On each side

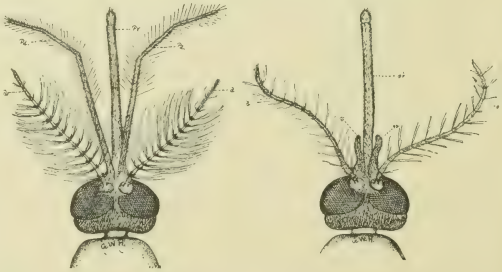


Fig. 8.—At left, head of male of Culex. At right, head of female of Culex. a. Antennae; pa. palpi; pr. proboscis.

of the proboscis near its base is a very short projection. These are known as the palpi. In the female Anopheles these palpi are nearly as long as the proboscis. Consequently the malarial female mosquito will always have three long projections from the head, whereas Culex has only one. (See figure 14.)

Malarial mosquitoes of Mississippi.—So far as is known there are only three species of malarial mosquitoes in the United States, and they all belong to the genus Anopheles. In fact so far as is known all malarial mosquitoes belong to this genus. Up to the present time one of these only, has been taken in Mississippi.* That one is Anopheles punctipennis. It has been taken at Agri. College out doors in June and October, and in the house in January. During July the writer found it in abundance in McComb City. Mr. James Brodie has sent it to us from Biloxi. There is no doubt that it is distributed widely over the State.

Breeding places.—Some time during the latter part of May, 1901, a ditch about four feet in depth was dug for the water main to the new textile building on the campus. The ditch was dug in sections, one of which ran down a considerable slope just at the end of the photographic building. This section of the ditch soon became partly full of rain water. At the lower end the water was two and a half feet deep, but the water did not extend more than a third of the length of the ditch up the slope. At the upper and shallower end of the body of water, it soon became covered with a thin green slime, which upon examination proved to be wholly of Protococcus. In this shallow, slimy water on June 4th the writer discovered an abundance of larvæ of Anopheles Punctipennis. They were recognized at a glance as larvæ of Anopheles from Dr. Howard's excellent drawings and descriptions of the larvæ of Anopheles maculipennis. Glass jars were immediately called into requisition, and many larvæ were carried to the laboratory, from a study of which the following notes were made. It might be of interest to say just here that there was also an abundance of larvæ of Culex pipiens in the same water in company with Anopheles.

In McComb City they were found in pools along the street-side ditches, only one block from Main street. At the time I took these specimens there was a severe case of malarial fever in the hotel not twenty rods from their breeding places. The pools were free from any algal growth on the surface but the bottoms were covered with

*Since writing the above I have taken A. maculipennis meigen, at Agricultural College. December 11, 1901.

a fine slimy sediment. In one of the pools where the larvæ were most abundant, cows driven along the street were in the habit of drinking. Another pool was a favorite place for swine to wallow. The water was muddy in both but not foul.

In Mocksville, North Carolina I found them abundant in pools left from dry brooks. The water was clear and wholesome, without plant growth on top. They were also found in the large quiet pools of a constantly flowing brook but not in abundance. It is interesting to note that on each side of this brook was a severe case of malarial fever.

On October 31st, near the College, I found Anopheles punctipennis (larvæ and pupæ), in shallow pools formed in impressions in the mud made by the feet of cattle around the edges of a large surface pool. These tiny pools contained no visible plant life on the surface, but the bottoms were of very fine slimy sediment and probably contained an abundance of food. Here also there has been considerable malaria among students and faculty. It will be noted in a study of the above breeding places that not one of them contains foul water, like the sewage water in which Culex was found. Evidence so far obtained indicates, that A. punctipennis does not breed in foul water. On the other hand while examining one of the sewer ditches spoken of above, I found an adult female Anopheles punctipennis clinging to the grass blades, growing close to the water's edge. Very careful search, however, failed to disclose any larvæ or eggs on the water anywhere along its course. It will further be noted that in not every case by any means, was there an algal or slimy growth on the surface of the water, although there was in every case an abundance of food on the sides and bottoms of the pools.

Dr. Howard has found the larvæ of Anopheles maculipennis, a very closely related species, breeding in very foul water, and it may be, that later we shall find this true of A. punctipennis.

Life history.—Like Culex pipiens the life history of Anopheles is made up of four distinct stages. (See figure 1).

Eggs.—The eggs of Anopheles punctipennis are laid singly and at random on the surface of the water, but naturally run together and cohere in loose irregular groups or strings of from three to a score or more. This is totally different from the boat-shaped masses of Culex eggs. The individual eggs differ greatly in shape from those of Culex. The egg of Anopheles is strongly convex below and concave

above. As seen from the side it is canoe-shaped. One end is larger and more blunt while the other and sharper end curves upward, (Fig. 9). Along each side runs a transparent and transversely wrinkled appendage, called the clasping membrane. It is said that this is for the purpose of keeping the concave side of the egg uppermost. When handled a great deal and especially after being kept in alcohol, this membrane breaks entirely away from the egg. This was especially true of the eggs put through several different strengths of alcohol and then brought from North Carolina. These eggs did not show the hexagonal markings seen in the first ones studied which is somewhat puzzling. The eggs varied from .55 mm. to .57 mm. in length. They hatched in 24 to 48 hours after being brought in, but no record was obtained as to the actual time of hatching after being laid, as none of the females laid eggs in captivity. It is probably safe to say, however, that they accord in this particular very closely with *maculipennis*.

Fig. 9.—Eggs of Anopheles punctipennis. a. side view. b. from below, enlarged.

Larvae.—As we have already pointed out the larvæ of Culex

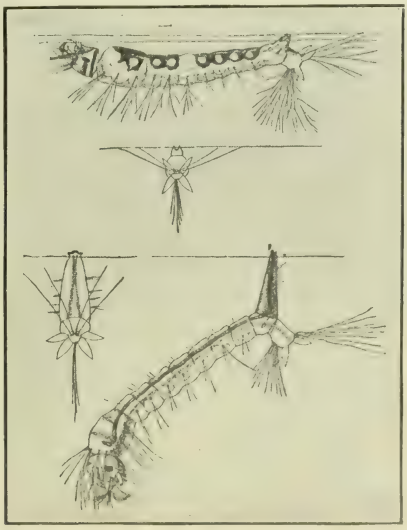


Fig. 10.—At top, half-grown larva of Anopheles in feeding position just beneath surface film. At bottom, half-grown larva of Culex in breathing position. Enlarged. After Howard.

pipiens hang from the surface of the water, as it were, with the head downward. On the contrary, the larvæ of Anopheles (Fig. 10) lie

in a horizontal position, apparently on the surface of the water. Really they are just beneath the surface film. Their breathing tube is very short and consequently they are obliged to lie close to the surface in order to get air. They can be readily recognized by this horizontal position. When disturbed they wriggle across the water in a horizontal direction, especially the younger larvæ. It will be recalled that the larvæ of Culex are constantly diving below in a vertical direction. As the larvæ of Anopheles become older they more readily wriggle downward. Among the microscopic differences may be mentioned the hairs along the sides of the body. In Culex these hairs are not branched, while in Anopheles they are. (Fig. 11). The young larvæ have a decidedly streaked appearance owing to at least three whitish stripes running transversely across the body. The hinder part of the third abdominal segment is more or less transparent and appears to the naked eye as a white streak. The forward part of the thorax is also transparent and appears as a white streak. Finally the hinder part of the seventh segment and the forward part of the eighth is somewhat transparnet and forms the third streak of which we have spoken. Besides these transverse streaks the whole body has a more or less mottled appearance owing to transparent spots in the body. As the larvæ grow older they lose the streaked appearance but retain the mottled effect to a considerable extent.

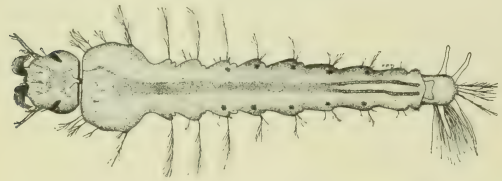


Fig. 11.—Larva of Anopheles punctipennis as seen from above, enlarged.

The feeding habits of Anopheles larvæ are very interesting and remarkable. The head is joined to the rest of the body by a very slender neck, on which it readily and rapidly rotates, at least half way around. When in position beneath the water film the body is in a normal position. That is, the upper side of the body is uppermost and the under side faces the bottom of the jar. The head however, is turned just half way around so that the under side is uppermost. This is its customary feeding position. If for any reason it attempts to swallow a piece of food too large and there is difficulty in getting it down, the head turns back with lightning-like rapidity. All the time the brushes of hairs about the mouth are in motion bringing to it particles of food.

The duration of the larval stage, under normal conditions with plenty of food, varied from twelve to fourteen days.

On June 5th three larvæ were placed in a jar containing very little food. What food there was lay among some sand at the bottom. Two of them were very young, while the third could not have been more than half grown. These larvæ remained there until June 29th, when the two younger died. These two did not go to the bottom after food and probably starved. The third and more mature one did go to the bottom after food and remained alive until July 3rd, when it was transferred to water containing an abundance of food. In a few days it transformed to a pupa. In this case the larval stage was over a month and could doubtless have been prolonged.

Pupae.—The pupæ of Anopheles are not strikingly different from those of Culex pipiens to the unaided eye, A close observer, however, can learn to distinguish the two with the eye by the difference in length of the respiratory siphons. Those of Anopheles are much shorter and wider as shown in figure 12. The head of Anopheles is narrower and more pointed than that of Culex (Fig. 12). The difference in size and shape of the thorax is also shown in figure. Like the larvæ the pupæ tend to wriggle in a horizontal direction when disturbed. They are not as active as those of C. pipiens, which fact is brought out very forcibly when one attempts to make a camera lucida drawing of the living pupæ of both in their natural position in the water.

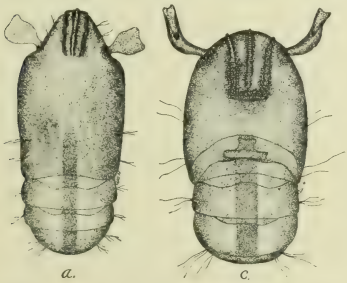


Fig. 12.—Pupae of Anopheles punctipennis.—a, and Culex pipiens, c, as seen from above in their natural position in the water, enlarged.

The pupal stage of both males and females lasted with great regularity just about two days. At least it could not have varied more than a few hours from this, as the adults were found in every case on the second morning subsequent to the morning on which the pupæ were found.

To sum up then, the entire duration of the early stages of Anopheles punctipennis under normal conditions in July was sixteen to eighteen days. That is, the egg stage was two days; larval stage, twelve to fourteen days; pupal stage two days. This indicates that in a pool where these mosquitoes breed there can be developed every sixteen to

eighteen days a new lot of adult mosquitoes ready to convey malaria. It further indicates that if such a pool be treated with kerosene oil, it will need an application once in every sixteen to eighteen days or three weeks at the most, to be perfectly safe.

Adults.—The full-grown male and female Anopheles punctipennis, (Fig. 13) are somewhat larger than those of Culex pipiens.

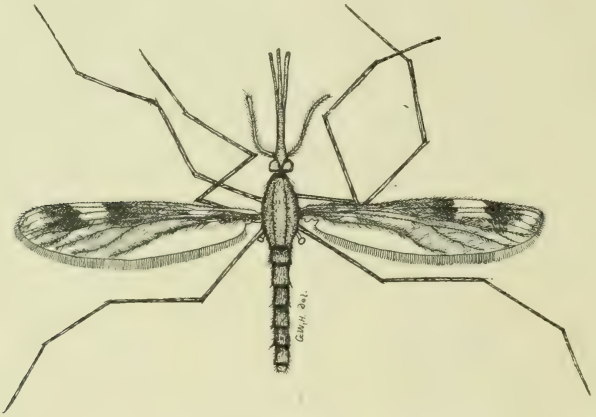


Fig. 13.—Female of Anopheles punctipennis; enlarged.

The wings appear of a heavier texture and show a spotted appearance owing to the well defined spaces covered with whitish scales. Situated on the front margin of each wing, three-fourths of the length of

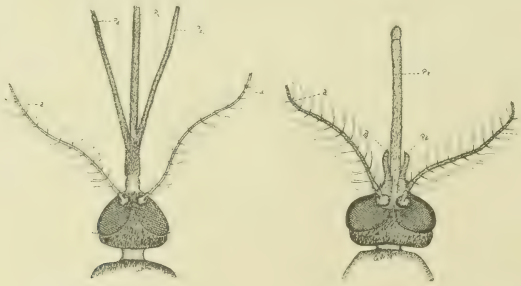


Fig. 14.—At left, head of Anopheles showing appendages. At right, head of Culex showing appendages. a, antennae; pa, palpi; pr, proboscis.

the wing from the body, is a yellowish white spot. These two spots

together with the other smaller ones give the mosquito a very handsome and distinctive appearance.

As we have explained before, the female Anopheles may also be distinguished from Culex by the three long projections on the head, (Fig. 14). That is, in A. punctipennis the palpi are nearly as long as the proboscis.

As has already been pointed out there are three species of Anopheles in the United States, only two of which we have as yet found in Mississippi. The other one however, has been seen in New Orleans in enormous numbers and there can hardly be a doubt that it occurs in this State.

Yellow fever mosquito.—The mosquito used in the experiments already detailed in Cuba, and that was there responsible for communicating yellow fever to six out of seven people bitten, is common in Mississippi. It is known to most of us as the "day mosquito." It is easily recognized from the habit of flying and biting during the day and from its white banded legs and body. We have taken this mosquito here at the College, at Summit, Miss., and at Magnolia, Miss. It is common in all the warmer countries of the earth. It has been taken in Cuba, West Indies, Louisiana, Texas, Arkansas, Georgia, and as far north as Virginia. It is a significant fact that its range is coincident with that of yellow fever.

At present I can say nothing of its breeding places in Mississippi. Of course it breeds in water like other mosquitoes and has been found by other observers, breeding in cisterns and rain-water tanks. Dr. Howard figures the larvæ and pupæ and says that these stages do not differ greatly from those of the species of the genus Culex.

This mosquito has in fact, been included heretofore in the genus Culex under the name Culex fasciatus. It has now been placed in a separate genus under the name Stegomyia fasciata, Fabricius.

Other species of mosquitoes taken in Mississippi.—Culex pungens Wied., Agr. Coll. Culex tarsalis Coq., Agr. Coll. Culex confinis Lynch., McComb City. Culex consobrinus Desv., Biloxi. Psorophora ciliata Fabr., Biloxi. Conchyliastes musicus Say, Agri. Coll. Anopheles maculipennis meigen, Agri. Coll.

Culex confinis.—On July 15, 1901, at McComb City I found many large larvæ among thousands of smaller Culex larvæ in a sewage ditch and in some roadside pools. They were so large that they

attracted my attention at once. Several of them were collected in wide mouthed bottles, transported some distance, and the adults obtained. The pupal stage was passed in about three days but I believe it was somewhat hastened by the unfavorable conditions.

The larvæ bore such a strong resemblance to those of psorophora ciliata that I referred to them, in my notes made at the time, as such. The breathing tube is larger than that of Culex pipiens or pungens. The four anal flaps are longer and more pointed.

Adult.—The mature mosquito is considerably larger than Culex pipiens. The legs are banded with white. In this respect it resembles Stegomyia fasciata but is larger and has not the conspicuous silver stripes on the thorax.

Breeding places of mosquitoes.—In trying to get rid of mosquitoes it is essential, first of all, to find their breeding places. Consequently it becomes of prime importance to know the nature of the places in which the eggs, larvæ and pupæ may be found.

In general, it may be said that almost any body of fresh water in almost any situation if left standing long enough, will become infested with larvæ of mosquitoes. The favorite breeding places at the College, are three ditches, all of which receive sewage. The waters in all are loaded with filth and at times reeking with foul odors. In the ditch that receives the sewage from the main system I have seen a black fringe of larvæ on both sides for over a mile. It is interesting to note that the tributary ditches to this one, containing water uncontaminated with sewage, have no larvæ in them.

It is ordinarily supposed that mosquitoes breed only in stagnant water or water that is changing very little. Here however we have found them breeding in considerable numbers in at least three different troughs for watering stock. These are furnished with hydrants, and in one case the water ran in at one end and out at the other all the time. In the other two the water was turned on only when the stock was drinking. In each case there was plenty of plant food on the sides and bottoms of the troughs for the larvæ to eat.

Here then in these cases we have the extremes of conditions. In the first, the water was full of decaying animal and vegetable matter and mosquitoes bred there by the million. In the latter the water was comparatively fresh and pure, yet they bred there in considerable numbers. Cisterns tight enough to be dark within often become infested with mosquitoes.

The Experiment Station office building suddenly became overrun with mosquitoes in the early part of July. It occurred to me to investigate a room in the second story left vacant by students about June 25th. As was expected they had left a bucket two-thirds full of slop water which was swarming with larvæ and pupæ. After being emptied the mosquitoes disappeared in the course of a week.

Mr. W. J. Gallaway tells me of finding an abundance of "wiggletails" in a glass globe of water standing on a table in the parlor of a house at which he was visiting. Fish had been kept in the globe, among some water plants growing there. The fish had died some time before and been thrown out and now the family were wondering where the mosquitoes were coming from.

As before related I found 257 egg masses in a small pig trough. In fact they breed in tin cans in which water is left standing or in almost any receptacle containing water.

The number of mosquitoes that may be produced from a small area of water.—In the case of the pig trough we had about five square feet of surface. If there were on an average 150 eggs in each mass, then this five square feet of water surface would furnish 38,550 wiggle-tails. If only one-half of them reached maturity it would be sufficient to stock a whole town.

Enough mosquitoes would develop from a rod of either of the ditches mentioned above to make every house on the campus uncomfortable.

Enough developed from the one bucket of water left by the students in their room, to necessitate using a bed net in every room in the Station building in order to sleep with any comfort.

It is interesting and enlightening to give in this connection some figures by Dr. Lugger, as to the actual number of mosquitoes bred from an ordinary rain barrel during the summer season. Dr. Lugger says, "on July 6th. the water in one barrel was filtered. It contained 35 grams of mosquitoes (wiggle-tails), each gram by count numbering 217, hence 35x217 equals 7,595 larvæ and pupæ. Besides this, 32 egg masses each containing on an average 302 eggs were found, which would hatch into 302x32 which equals 9,664 mosquitoes." In other words one rain barrel on July 6th. had in it potentially 17,259 mosquitoes.

How far do mosquitoes fly?—Only one personal observation can be added to this already much discussed but still unsettled

subject. During the summer of 1899 while absent from the College, the mosquitoes became exceedingly abundant in the houses on the northern end of the campus, while those on the southern end were practically free from them. These houses are about one-half mile apart. About ten days to two weeks from the time they appeared on the northern end they became somewhat annoying on the southern end of the campus. By that time their breeding place had been discovered and the larvæ and hundreds of the adults had been killed with kerosene. It is important to note that they did migrate at least one-half a mile. It should be said however, that there were buildings all the way between the two ends of the campus, whereas had it been clear open ground, perhaps they would not have gone so far.

Dr. Howard gives several observations to show, that in cases where people thought they were troubled by mosquitoes that had come from a long distance, they were really troubled by those breeding in over-looked pools near by. He does not believe that these insects fly far except under conditions that do not ordinarily occur.

The question is an important one, because it would be very discouraging and seem almost useless to spend time and money in destroying mosquitoes near at home, if one's neighbor two or three miles away allowed them to breed there.

How late in the year will mosquitoes breed in Mississippi?—As this paragraph is being written, on the 11th. of November, mosquitoes are depositing eggs freely and developing in abundance everywhere.

From some observations made in the autumn of 1900, it will be seen that under certain conditions mosquitoes will breed much later than this. During the late summer of 1900, my cistern had been emptied of water, repaired, and allowed to remain in that condition awaiting the winter rains. Some time in December, mosquitoes became abundant in the house. Later my attention was called to the fact that they were also in abundance in the mouth of the cistern which was covered with wire gauze. On the 24th. of December the writer examined the cistern and found four or five inches of water in the bottom that had run in before the inlet had been closed. In this water we found a considerable number of larvæ and pupæ. In the neck of the cistern were many adult, active mosquitoes, of the genus Culex. Undoubtedly they would have gone on breeding in there for some time, because the air in the cistern was warmer than the outside air although it had been a very mild autumn.

These observations are important, to show how late in the season one must fight mosquitoes to keep rid of them. It will not do to relax in our warfare before December in ordinary cases and in special cases considerably later than this.

Remedies for mosquitoes.—To fight mosquitoes effectually we must attack them in some one of their immature stages; namely, egg, larval or pupal stage. It is not practicable to destroy the adult insect in any numbers.

The three principle means by which we can destroy the larvæ and pupæ of mosquitoes are as follows: by draining a pool, by introducing fish into a body of water, and by placing a thin film of oil on the surface.

Drainage.—This remedy hardly needs discussion. It is obvious that if a pool be drained or a bucket or barrel be emptied no mosquitoes can breed there. In our work against mosquitoes here at the College, in some cases, tanks not especially needed have been taken down. This should always be done whenever possible because a tank down and out of the way will be sure to give no trouble. All receptacles, like buckets, barrels, etc., are carefully looked after and emptied at least once a week and permanently if possible. The two ditches that have troubled us most are to be tiled and the water conducted to the main sewer in which it will be carried a long distance from the College. When this is done I confidently expect that our trouble from mosquitoes will be entirely stopped. In many cases, it is much easier to draw a wagon load of earth or even more to fill up a small shallow pool than to dig an outlet. Draining is the most desirable means of fighting mosquitoes because if once well done it is always done and needs no attention afterward.

Fish.—Much of the drinking water for the stock in this State is caught and stored in surface pools. The stock is allowed access to these pools at any and all times. The consequence is, that the water is apt to become more or less filthy and in addition a breeding place for mosquitoes. Such pools cannot be drained because the water is absolutely essential for the stock. Neither is it desirable to pour oil on the surface because the water is thereby rendered unpleasant and obnoxious to the animals. In such cases the best remedy against mosquitoes is the introduction of certain kinds of fish into the pools. There are on the College campus no less than four such pools. They are all stocked with fish and up to the

summer of 1901 I had never seen a "wiggletail" in any of them. In the early part of the summer I found a great many mosquitoes coming from one of them, and since this particular pool was of no actual necessity it was drained. In the draining very many fish were taken from it. They were all of a species of trout and were remarkably similar in size, ranging from seven to eight inches in length. I believe that these fish had grown too large to be of any value as destroyers of "wiggletails." They had become too large to enter the shallow places about the edges of the pools and these are just the situations for mosquitoes to breed. Another fact should be mentioned. A year ago large numbers of small bull-head fish in the pool died from the effects of a peculiar and unknown disease. It is quite possible that these smaller fish had been the means of keeping the pool free from mosquitoes and at their death it became an open breeding place for them. It is evident that small, active fish with voracious habits of eating, is the kind needed for destroying "wiggletails," and pupæ. A species of fish meeting these requirements is one known as the Top-minnow (Gambusia affinis). These never grow to be more than one to one and three quarter inches long. They are active and voracious and feed near the top and penetrate to the shallowest parts of the pool about the edges. Here they find themselves safe from their enemies, the larger fish, and at the same time in the presence of desirable food. They are common in all the streams of the Gulf states, hence just suited to their environment. Dr. Howard writes of this fish as follows: "It feeds largely on vegetable matter but also on insects. Larval mosquitoes have been found in its stomach." Again he says, "Dr. H. A. Veazie, of New Orleans, writes me, that this little fish is common about New Orleans and that where it is present he has not been able to find mosquito larvæ of any kind."

One objection to using the Top-minnow is that it easily falls a prey to other fish from the fact that it is a soft-rayed fish and thus without means of defense.

A fish which will perhaps answer better than the Top-minnow although larger, is the common "Pumpkin-seed" or Sunfish. It will answer better because it is wholly a carnivorous fish and because its fins possess spine rays and afford it protection from being eaten by larger fish. The latter fact makes of it an available fish for pools already inhabited by larger fish. It is a very prolific fish and its young do not grow rapidly. They therefore will remain small enough during the first year to enable them to penetrate the

shallowest parts of a pool. By the next season there will be another generation of small sunfish and thus the supply of small fish is maintained from year to year.

One of the best solutions, so far developed, of the mosquito question in permanent pools is the introduction of one or more of the species of fish mentioned above. There still would remain those tiny pools made in the foot-prints of stock, about the permanent pools in which I have especially noted the breeding of Anopheles punctipennis. These pools of course could not be reached by any fish from the main pools, because they are transient and isolated. These must be treated in a manner to be explained in the following paragraphs.

Oil as a remedy for mosquitoes.—The power that oil has, to kill the larvæ and pupæ of mosquitoes has been known for some time. Its practical use against these insects has been of comparatively recent date.

How it kills.—If oil be poured upon water it will sooner or later spread evenly over the surface in a thin film. This film has a comparatively strong tension, and speaking from the standpoint of an insect, is very difficult to break. The larvæ and pupæ of mosquitoes as we have already shown breathe air direct by thrusting the ends of the respiratory tubes out of the water. As they come up beneath the oil film, to obtain air they are unable to push their tubes through the oil and thus are completely shut off from the air and in a short time drown from suffocation. It may also be that the oil as it comes in contact with the respiratory tubes produces injury which hastens death. If any eggs are lying on the surface of the water and are touched by the oil they are destroyed. Likewise the adult female mosquitoes are caught in the oil and killed when depositing eggs.

Results of work with oil at the College.—As before stated our trouble with mosquitoes has come from the two sewage ditches described above. The banks of both these ditches are covered with grass and weeds that in many places overhang the water. The current in each is plainly noticeable. For instance, a straw will float steadily down stream, perhaps one-fourth as fast as a man can walk. This current has exercised a decided influence upon the manner of the application of oil to be detailed below. In the summer of 1899, in which the mosquitoes became so abundant in the ditch receiving the hospital sewage, I used an ordinary five

gallon knapsack sprayer and a Deming "Bordeaux" nozzle to distribute the oil which was ordinary illuminating oil. I found that in so doing literally thousands of adult mosquitoes, that were resting unobserved on the grass and weeds that overhung the water and arose in swarms as the oil struck them, were killed and fell back to float away with the larvæ. This summer upon my return to the College in September, I found the other sewer ditch in precisely the same condition and gave it exactly the same treatment with identical results. If the oil had been quietly poured on the surface the adult mosquitoes would not have been touched because the current would have carried the oil away before night came. Again, by spraying the oil, it reached the shallow places along the bank and drove the larvæ and pupæ out into the current where they floated down stream, in millions, to be drowned. Had the oil been poured on, it would not have reached the shallows as will be shown in the next paragraph owing to the strong current. In such case a majority of the larvæ and pupæ would have escaped.

Is the pouring of oil into water-closets effective in sewer ditches?—It has been asked of the writer so many times whether or not the same thing could be accomplished by pouring oil into the closets and allowing it to run down the sewer pipes, as by spraying, that it seemed worth while to give this point considerable attention. Accordingly I poured two quarts of illuminating oil on the surface of the water in the main sewage ditch near the mouth of the tile to watch its effect below. A fairly quiet pool about two rods long and about fifteen rods below the outlet was selected as the first place of observation. Both sides of the pool were lined with multitudes of larvæ and pupæ lying in the shallows and in the miniature bays hollowed out of the sides of the bank. The current was about the rate described above. By the time the oil reached the pool it was well distributed. The result was, however, that the current was too strong to allow it time to spread into the quieter parts and bays of the pool. It was carried for the most part straight by. Many of the larvæ and pupæ however, lying next to the current were so greatly disturbed that they blundered into the middle of of the stream and were drowned beneath the film of oil. In a second and similar pool, about ten rods farther down, the effect was noted again. The oil had spread out even more by this time but the effect was about the same. The majority of larvæ and pupæ escaped, because the current gave the oil insufficient time to spread over them. Nevertheless, I believe that several applications of oil

say one or two hours apart would kill the majority of larvæ and pupæ in such pools. A similar experiment repeated in another ditch gave precisely similar results with one additional point worthy of note. In one of the pools carefully observed, a thin mass of Algæ and scum rested over quite an area adjacent to one of the banks. In it were many larvæ and pupæ. Into this mass the oil never penetrated and in my opinion with that current never would, no matter how many applications were made.

It would seem then, that the only sure and quick remedy for such places is to spray the oil on. By this method many adults are killed at the same time. If poured into the sewer several successive applications must be made to be in any great degree effective, and even then in pools where there was Algal slime it would have no effect. It is evident that if the sewer pipes empty into pools or bodies of water with no current the above conclusions would not apply.

Success attending the application of oil to the breeding places of mosquitoes.—Up to the time the writer left the campus, August 7th. no one had had any occasion to use a mosquito bar. In fact there were no mosquitoes on the campus. All tanks and vessels containing water had been carefully looked after and either treated with oil or emptied. The ditches in question had been treated every two weeks with a coat of illuminating oil. It was only after my absence when there was no one to look after the ditches that they became breeders of mosquitoes. I am thoroughly convinced that any neighborhood in Mississippi, under ordinary conditions, can keep free from mosquitoes if the proper effort is put forth. Every man should become interested enough to take care of his own premises, and a reliable, observing, careful man should be detailed and paid to look after all places that seem to fall to no one especially.

Kinds of oil to use.—In all my experiments here, ordinary kerosene oil, such as is used for illuminating purposes was used. In the first place the ditches with their strong currents, needed a light oil that would spread as rapidly as possible. In the second place, petroleum has cost us just as much as the refined oil, even if bought by the barrel. Now that the Beaumont field has been opened up, perhaps we can buy petroleum more cheaply. For bodies of water that have no current a heavy oil would be superior to ordinary kerosene because the former would not evaporate so quickly and

thus need not be applied so often. On the other hand, an oil too heavy will not spread easily but will gather in spots here and there over the surface, thus losing its effectiveness. Dr. Howard says, "so long as the oil flows readily and is cheap enough, the end is gained, provided it is not too light and does not evaporate too rapidly." Other experimenters have found, that what is known as "Light Fuel Oil" sold by the Standard Oil Co. is the most satisfactory.

Amount of oil to use.—It takes six gallons of oil to spray the shorter ditch of which we have spoken, if the weeds and grass along the banks are sprayed as in the first case. This ditch is about thirty rods long. Ordinarily the sides are not sprayed and in this case three gallons are amply sufficient. The ditch can be given a good spraying by one man in half an hour. The expense of one spraying then is as follows: Three gallons of oil at 18 cents each equals 54 cents; one hour of a man's time, 15 cents; total 69 cents. At this rate it would cost $1.38 per month to keep this ditch free from mosquitoes if sprayed twice a month as it ought to be. With care it could be done more cheaply.

With still quiet pools where no current exists the amount of oil to be used differs very greatly from that mentioned above. On a quiet pool where the oil remains until it evaporates, a little will spread over and cover a large space. Careful experiments in this line have demonstrated that, in general, one ounce of kerosene is sufficient for every fifteen sq. ft. of surface. At this rate a tank ten feet across would require about one and one-half pints of oil which would cost about three and one-half cents. If the ditch spoken of above had no current and averaged two feet wide for the whole thirty rods, it would cost only about ten cents for the oil to treat it. Actually in treating tanks and still bodies of water I use two or three ounces to every fifteen sq. ft. of surface. For instance, in treating a wooden tank on Nov. 9th. that was seven feet across, I used two quarts of oil which was amply sufficient. A teacupful or even a half a teacupful is sufficient for an ordinary rain-barrel.

How long will the oil remain effective?—It is important to know the length of time that an application of oil will remain effective because this will determine in some measure the frequency of application.

The tank spoken of above, stands in the north-east corner of the Station office building in an angle made by the ell and main part.

In this position it receives only the morning sun and that for only a short time. This fact must be taken into consideration in the following observation.

On the 9th. of October we treated the tank to an application of two quarts of oil. On the 16th of October, just one week from that

FIG. 15.—Spraying a grass-grown sewage ditch, with an ordinay knapsack sprayer and "Bordeaux" nozzle for mosquitoes.

time, and a week of clear, dry weather, I examined it and found a thick coat of oil on it still. In stirring the water with a broom stick the handle was so thickly coated with oil that it had to be carefully and thoroughly wiped before it could be used. It seemed to me that the oil was nearly as thick as when first applied, but of course some

must have evaporated. At any rate it was sufficient to be perfectly effective against larvæ, pupæ and adults. We intended to make an observation later, but unfortunately it rained in the meantime and the tank ran over. Thereby hangs another point that should be mentioned. In treating bodies of water that are liable to overflow the application must be made oftener, because the oil is the first to run off since it is always on top.

In this instance the oil was effective for a week and I am sure would have been so for another seven days. Dr. Howard says, that the oil is effective for some days after the odor has disappeared and after the iridescent effect on the water has ceased to be perceptible to the eye.

How to apply the oil.--As detailed above the writer believes the best method of applying oil to ditches to be by spraying it on with some kind of a force pump. Our knapsack sprayer holds five gallons of oil and has twelve feet of one-half inch hose attached. The hose is furnished with a "Bordeaux" nozzle which is tied to a slender pole about six feet long. With this pole the operator can reach both sides of the ditch if not too wide without moving across, and can thrust the nozzle among the grass and reach all parts of the banks. (See figure 15).

In cases of tanks, barrels, cisterns, cans, and all quiet bodies of water, the oil may be poured on or thrown on from a cup, dipper or other receptacle. In fact it may be poured on the surface to advantage in some cases from an ordinary bucket sprinkler.

How often to apply the oil.—It has been shown in our study of the life history of Culex pipiens that the entire life cycle may be passed in eight days. In the case of Anopheles punctipennis, the life cycle lasts from eighteen to twenty days. These facts alone, indicate the necessity of frequent spraying. I have found that once in two weeks is often enough for the sewage ditches. No doubt the oil is effective along the shallow edges of these ditches for some time after it is applied. That is to say, the oil along the edges does not run off immediately because of no current. On quiet pools oil is effective for several days after it is applied because it does not readily evaporate, as shown in the case of tank.

It is safe to say that an application of oil should be made at least twice a month to be surely effective. Possibly in certain cases oftener, especially in drains where the current is fairly strong.

Will flooding ditches and drains carry away the larvae and pupae of mosquitoes?—Lest anyone be lulled into a sense of security after a severe rainstorm, by thinking that the "wiggletails" have all been washed from the drain, a final word must be said in regard to this phase of the subject.

While sojourning in McComb City in July of the past summer, the writer found a ditch running through the town one-half block from Main street literally alive with the larvæ and pupæ of Culex pipiens and of what I now know to have been Culex confinis. At the head of one pool in the ditch, a drain from a private house joined it and here were the "wiggletails". An hour after finding the pool it was my pleasure to sit on the back porch of a hotel and see that ditch become a raging, roaring torrent ten feet wide and four feet deep, because of a tremendous rain-storm. It was with pleasure, because it seemed to me that the larvæ and pupæ must be carried away by the torrent. By the following morning the ditch had assumed its normal proportions and quietness, but what was my surprise to find the majority, as I judged, of those larvæ and pupæ still in their old places next to the banks, apparently as undisturbed as ever. They had evidently risen with the flood, floated outward to the edges, and then as the brook receded, slowly drifted with the water to their normal level.

In my first attempt to rid the smaller sewage ditch of larvæ, the water from the faucets of ten bath-tubs and one three-inch hose was turned into the ditch in hopes of flooding them out, but no appreciable effect was made on them.

SUMMARY.

It has been demonstrated beyond a doubt, by scientific research and practical experiment, that the germ causing malaria is conveyed and deposited in the blood of human beings by certain species of mosquitoes. At least one of these species; namely, Anopheles punctipennis, is abundant everywhere in Mississippi

It has also been shown with apparent certainty, that yellow fever is communicated from one person to another by a certain species of mosquito (Stegomyia fasciata) which is abundant in Mississippi.

The most common mosquito in the State, is probably Culex pipiens. This mosquito lays its eggs on the surface of standing water in comparatively large masses. Here they soon hatch into "wiggletails," which finally develop into adult mosquitoes. Culex pipiens so far as is known, does not carry any disease from one person to another. These mosquitoes breed in foul ditch water, buckets of standing water, tin cans containing water, barrels of rain-water, hollow stumps, cisterns, tanks, pig troughs, pools, and even in vessels in houses containing water.

The most common malarial mosquito in the State is probably Anopheles punctipennis. Like Culex this mosquito also lays its eggs on standing water, but separately. There they soon hatch into "wiggletails" which in a few days develop into adult Anopheles. The "wiggletails" of Anopheles may be known from those of Culex by the fact that the former lie flat, on or very near the surface of the water, while the latter hang head downward in the water at an angle of about 40 degrees.

They breed in ditches, in road-side pools of water and in small pools formed in compressions made by the feet of cattle, in the mud, around the edges of large surface pools. So far as observed they do not breed in foul water.

A very great number of mosquitoes may be produced from a comparatively small body of water, hence it is important to look after the little pools of water.

It is believed that mosquitoes do not, under ordinary conditions, fly very far. In such a case one man should not deem it labor in

vain to fight them on his own place even though his neighbor a mile distant, does nothing to destroy the mosquitoes there.

Mosquitoes are fought most effectually in the early stages of their development.

There are three main remedies against the early stages of these insects, namely, drainage, fish and oil, (refined or unrefined). Perfect drainage wherever it can be had is the most desirable, because it is the most effectual. By drainage, is meant either drawing off the water by an outlet or by filling up so that the water runs off. In permanent pools that cannot be drained, certain kinds of fish such as the Top-minnow (Gambusia affinis), the Sunfish or "Pumpkin-seed," should be introduced. In all other cases in which it is not desirable to use either of the above remedies, a thin film of kerosene oil or petroleum, one ounce to every fifteen sq. ft. of surface should be applied to the surface of the standing water. Cisterns from which water is drawn by a bucket can be kept closed by a wire screen door or a few fish may be placed in them. The same may be said of tanks.

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Mississippi Agricultural Experiment Station.

BULLETIN No. 75.

STRAWBERRY CULTURE IN MISSISSIPPI.

By A. B. McKAY.

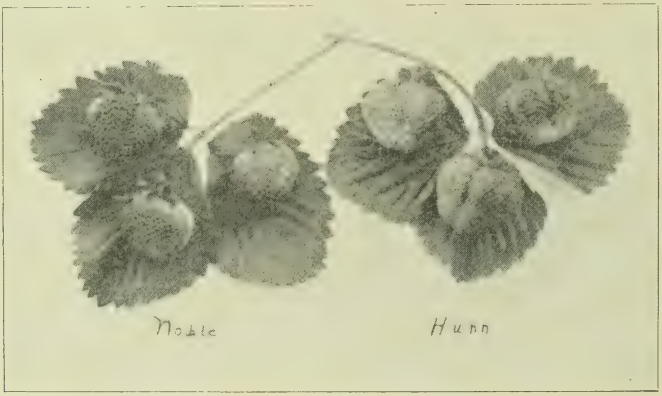
Strawberry Plat—Test of Varieties.

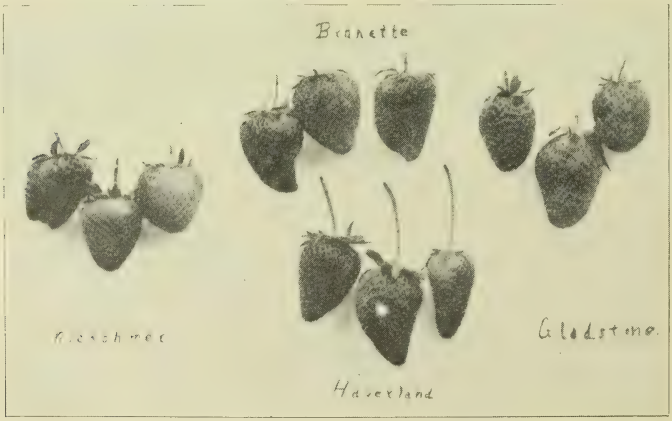
AGRICULTURAL COLLEGE, MISS.

JANUARY, 1902.

MISSISSIPPI STATIONERY CO., YAZOO CITY.

Gardner
Clarence


Noble
Hunn


Brunette
Gladstone
Haverland

STRAWBERRY CULTURE IN MISSISSIPPI.

Introduction.—In the list of fruits adapted to Mississippi, the strawberry stands uniquely alone in three particulars: (1) It is the first fruit of the season; (2) It requires less time than any other from the date of planting to that of the first ripe fruit; (3) A total failure seldom occurs.

The writer has grown the strawberry in this State, for home use and for market, for twenty-five years, during which time he has had every opportunity for watching its behavior on a variety of soils, and in many localities. In presenting this bulletin, which will find its way to thousands of Mississippi homes, he has endeavored to encourage a more general cultivation of this luscious fruit, especially for home use; and to give information calculated to assist hundreds of readers in growing it successfully and cheaply.

The time is past when the strawberry should be considered a luxury at any home in Mississippi where there is land on the premises that will produce the common garden vegetables. Just why a fruit so easily grown, and so keenly relished by so many people, is found on so few tables, especially in the rural districts, is difficult to understand. The chief reason might be found in the fact that the majority of such as might succeed admirably with this fruit have never planted it; and not a few of those who have planted, and who report total or partial failure must admit that they have not given it a fair trial.

Soil.—With good treatment the strawberry will adapt itself to, and make fruit on, almost any kind of soil. Like other fruits, however, it shows decided preferences. It is a clay-loving plant, and succeeds better on a fine-grained, rather compact soil, one that will absorb and retain large amounts of moisture, than on one that is loose, ashy and of a thirsty nature.

For inexperienced growers, a soil of medium fertility is safer and, in many respects, better than one that is over rich. Many who plant only for home use make the serious mistake of selecting rich garden soil, and of adding thereto, just before or just after setting to strawberries, quantities of barnyard manure or other strongly nitrogenous fertilizers. Aside from the expense of "working the

plants to death" to keep down grass and weeds on such soil, the grower finds, when too late to remedy the trouble, that he has succeeded in producing large, showy vines bearing little or no good fruit. Later in the season he discovers the fact that, in our latitude, such over-grown, sappy plants cannot survive our long, hot summers. If dry weather prevails during mid-summer, possibly not one plant is left to tell the tale of destruction. Disappointed, disgusted, perhaps, the once enthusiastic grower refuses to try the second planting, and decides either to do without strawberries or to purchase what his family may use.

Varieties.—These are now numbered by hundreds. Catalogues filled with pictures and glowing descriptions of varieties are apt to be misleading. The work of testing new varieties must be left largely to experiment stations, and to growers who have the means, the time, and a taste for experimenting. However, a little trial patch composed of not more than twelve or fifteen plants each of several promising kinds would cost but little, and to the grower, might prove interesting and profitable. The safest plan for the beginner is to plant such kinds as have been most reliable in his section. Excelsior, Hoffman, Lady Thompson, Cloud, Klondyke, and Gandy (these varieties are named in the order in which they begin to ripen) have given pretty general satisfaction in nearly every section of Mississippi where they have been tried. The Excelsior and the Klondyke are new introductions, but they have come to stay. All things being equal, secure plants as near home as possible, thus diminishing the chances for delays in transit, injuries to plants from drying out or heating, importing disease and injurious insects, and misunderstandings between purchaser and parties from whom goods are obtained.

Planting.—The season for this work may begin with the first good fall rains, and continue until about March 15th., or so long as the soil remains cool and moist. Successful plantings are sometimes made during midsummer, by taking advantage of spells of rainy weather, and shifting plants, with dirt adhering to the roots, to nicely prepared soil near by. Where possible to secure good stands from midsummer and early fall settings, quite a nice yield of fruit may be expected the following spring. There is little if any risks attending settings made from November 10th. to December 10th., and from February 20th to March 10th.; the former planting becoming well established before the advent of severest freezes, the

latter escaping the cold and becoming well rooted before dry, warm weather. Settings made during late February, on good soil, frequently make, during the following April and May, more than sufficient fruit to cover the cost of plants and the expenses incident to setting out and cultivation.

As a setting of strawberries should stand from two to four years, the land should be thoroughly broken and pulverized to a good depth before planting. The rows should be slightly elevated and about three and one-half feet apart. Varieties like Excelsior and Lady Thompson which are inclined to make many runners (new plants), are set eighteen inches to two feet apart in the row; those which make but few runners are set closer. If considerable fruit is desired the first spring, and plants are plentiful, set six inches apart in the row.

At no time between the taking up and the resetting of plants should the roots be exposed to sunshine or to the drying effect of wind. If bright weather prevails, muddy or puddle the roots, or keep them covered with some moist substance until they are committed to the soil. If the roots are very long, it is well to cut them back to four or five inches in length.

The setter should follow immediately behind the dropper. Care should be taken to spread out the roots of each plant in their natural position, and to finger in around them well pulverized soil. The depth for setting each plant is fixed by its center bud, or crown, which should rest a little above, or just at the surface of the ground. In no case should the crown of a plant rest beneath the surface in a clay or waxy soil. On such soils it is safer to plant too shallow than too deep. If setting is done during warm weather and in dry soil, pour one pint or more of water around each plant, and throw over the watered surface a little dry earth to prevent crusting. If hot sunshine and wind prevail, a handful of short straw, half rotted leaves, or like material, left over each plant for three or four days will conserve moisture until root growth is resumed.

Cultivation.—The cultivation required for strawberries, whether the planting be a small gorden square or large areas in the field, does not differ materially from that given the average garden vegetable or the nicely treated corn or cotton crop. No set of iron-clad rules should be closely followed in the cultivation of any plant. Differences in lattitude, season, soil and other factors render it necessary so to vary general rules as to harmonize as nearly as

possible with existing conditions. The following suggestions on cultivation are offered to aid the grower in the exercise of his own judgment and good common sense.

The object of the first year's operations being the development of a perfect stand of strong, vigorous plants for the following year's fruit, little if any consideration is given the fruit that may appear on the plants during the spring immediately following the setting of plants. The rule is to begin cultivation as soon in the spring as the soil is in condition to work. If, however, the fall and early winter plantings promise a good yield of fruit, and if the vines are strong and vigorous, cultivation may be deferred until the bulk of the fruit has ripened. Under no circumstances, however, should the plants be permitted to become too much weakened from overbearing or from lack of cultivation.

Just as with cotton, potatoes and cabbage, cultivation should be sufficiently often to keep the soil free from weeds and grass and in good tilth. As the vines are low and rest just over the surface of the ground, more care must be exercised than with taller plants to prevent covering with earth and to keep the soil nicely rounded up to the plants. The sweep, the single-horse cultivator, and the garden harrow will accomplish nicely the required work between the lines of plants; and the common garden hoe or the light cotton hoe and the potato (four to six pronged) fork are the only implements needed to keep the soil along the line of the row in proper shape. Frequent and shallow cultivatiou will make of the surface soil a "dust mulch," or covering, which during periods of protracted dry weather, is the cheapest, and the most practical manner of conserving moisture in the soil.

It is safe to say that the cultivation of a planting of strawberries during the entire year need not cost much more than half as much as that required to keep in proper shape an equal area devoted to the list of common garden vegetables. As a rule, horse implements may be laid aside from about November 1st. (sometimes earlier) until after the fruit harvest the following spring—a period of five or six months. Stirring the soil shortly before fruit season retards the ripening period, and, in the absence of an abundance of mulching material, renders the fruit sandy. Any grass or weeds that may interfere with the proper development of plants or fruit shortly before or during picking season may be clipped off just above the ground with very sharp hoes so as not to break the surface soil. No matter how large and how fine the fruit, nothing so much hurts the sale of

strawberries, and nothing is so disagreeable while eating them, as to see and taste, along with them, sand or dirt. When once they have become sandy or dirty, it is almost impossible to make them clean by washing. On a freshly cultivated soil, or where the surface has been much disturbed in the process of surface weeding, a dashing shower of less than one minute's duration makes the fruit sandy for several days to come—possibly for half the picking period.

As cultivation during the second year must be deferred until after the fruit is gathered, the method of beginning the work must necessarily differ somewhat from that suggested for the first year. Remembering that several months have elapsed since horse implements were used, and also, that, during the picking season, it was necessary to tramp the ground almost daily in gathering the fruit, we can easily account for the hard and more or less compact condition of the soil. Another condition differing from that of the first year is found in the fact that, in place of a single line of young plants ranging from six inches to two feet apart in the row, we now have a strip, or band, twelve to eighteen inches wide, extending along the line of the row, which is more or less thickly matted with plants. These surplus plants must be reduced to a stand, and the soil put in condition to start rapid plant growth. The process is about as follows: With a sharp one-horse turning plow bar the rows off, leaving a narrow strip covered with plants. With nicely matted rows we may plow away one-half to two-thirds of the plants, leaving only the younger and more desirable ones along one edge of the row. Following immediately behind the turning plow, and in the bottom of the turning-plow furrows, a sub-soil plow should run as deeply as the strength of a strong mule or horse will permit. A one-horse Brinley turning-plow, with the wing removed, and a sharp steel point tightly screwed on, makes an excellent sub-soiler. In the absence of a sub-soil plow, the bulltongue, or scooter will answer. A fine-tooth harrow, well weighted, is run once or twice over each middle to smooth down the soil between the rows. Hoe hands follow, cleaning weeds and grass from the drill, and cutting plants to the required stand—eight to ten inches apart in the row. If dry weather prevails, some earth should be worked back to the plants almost immediately after barring off and sub-soiling. One trip on each side of the line of plants with a shovel plow will leave a nice little ridge of pulverized soil sifted between, and to each side of the plants. In this condition, unless very dry, work may be suspended without injury to the plants until the grass and other green rubbish covered in the middles have had

time to die. The turning plow is then used to spread the middles, or work the soil back to the plants. Follow the turning plow with the sub-soiler as directed after barring. We now have the soil deeply stirred and well-broken throughout the entire space between the lines of plants. The sweep, the cultivator, and the harrow used from this time forward, as directed for the first year's cultivation, will complete that of the second. Cultivation for the third and succeeding seasons is the same as for the second.

Developing a stand.—The ideal stand is one in which the plants are so distributed over a twelve to eighteen-inch strip along the line of the row that each separate plant will be from four to five inches distant from its nearest neighbor. Such a stand is seldom seen, because of the expense in time and in painstaking labor necessary to its perfection. Doubtless such a stand should yield the maximum quantity of choice fruit, but, as a rule, it would not be good economy to incur the expense necessary to attain such a crop.

As already stated, in making new settings, plants are placed from six inches to two feet apart in a straight line along the row; and surplus runners that are to assist in forming the matted row must be developed from this single line of plants. While some varieties naturally develop more runners than others, season has much to do with the resulting crop of new plants. During a very dry summer and fall, it is frequently difficult, in this latitude, to secure a sufficient number of new plants to form a good stand, unless we are careful to look after the runners from the very start. On most varieties the first runners begin to make their appearance during the latter part of April or early in May. As these straw-like appendages are thrown out in every direction it is only necessary to turn such as go wrong in the direction of the line of old plants, bringing the new buds in contact with the surface soil, and properly spacing them over the portion of row that is to be covered with plants. A clod or a small amount of earth placed over the runner near the bud will hold the latter in place. If the soil is in proper condition, roots will develop rapidly; and, after a few days, the bud becomes a well rooted, new plant.

During wet seasons, the question, "How shall we manage surplus runners?" is frequently asked. Cutting off the surplus runners as they appear is sometimes advised. The usual method, however, is to root the best runners, as advised above, until the desired space is occupied with well established plants. This accom-

plished, any runners that pass beyond the limited area are treated as so many weeds. If, on the advent of cool, moist fall weather, the rows are found to be too thickly matted with plants, carefully dig out such as may be wanted for making new settings, and cut the remaining surplus away with sharp hoes. This thinning should be done in time to permit the development of strong, well rooted plants before severe winter weather. Missing places should be filled as early as possible in the fall. After the first good rains it is an easy matter to dig the plants with soil adhering to the roots, and reset them in vacant places along the row, as advised for summer plantings. When it is desired to sell the surplus plants, thinning is sometimes delayed until mid winter or early spring, the plants being dug just as they are wanted to fill orders. This is very well for the purchaser, but the practice is detrimental to the following fruit crop. If, however, the compensation for plants equals or exceeds the shortage in fruit, financially speaking, there is no loss. Strawberry plants dug during early winter, neatly tied in bunches with twenty-five to fifty plants to each bunch, and placed in trenches so that the roots of each bunch are surrounded with mellow soil, only the tops being exposed, will keep nicely for two or three months. Thus "heeled in," a cover of leaves or straw eight to twelve inches deep, applied only during freezing weather, will be the only winter protection required. Orders may be filled on short notice from the trenches, when several weeks delay, on account of cold and wet weather, or injury to the soil, might result from filling orders directly from the rows.

Fertilizers and their application.—Where fertilizers respond nicely to vegetables and field crops, we may reasonably expect corresponding results from the same fertilizers applied to strawberries. It does not follow, however, that what may be profitably used in one soil is to be recommended for another differing in character and in condition. In most of the clay soils of Mississippi, there is sufficient potash to supply the demands of the so-called potash plants, the strawberry being one of the number included in this list. We have no data based on carefully conducted experiments which indicate that it pays to use much potash for strawberries in any but the sandy sections of the state. On the other hand, in most cases where it is advisable to use fertilizers at all, phosphoric acid seems to be the food demanded in largest quantities. In some soils nitrogen may be used quite freely, but care must be exercised not to over-stimulate plant growth, especially just before and during the fruiting period. Just what fertilizers and how

much of each may be most profitably used must be determined largely by actual experiment, the grower himself conducting the experiments on his own grounds.

The following kinds and the amount to the acre are suggested for trial on the clay or clay loams: 400 pounds of acid phosphate and 200 pounds of cotton-seed meal. On sandy loams add 100 to 200 pounds of kainit. In applying fertilizers it is well to make it a rule to leave blank, or unfertilized plats, here and there; also to apply larger amounts to some plats than to others. It is by this method alone that the real value of any given fertilizer or mixture of plant food can be accurately determined.

In using the mixture suggested adove, it would probably be best to apply half during June or early July, and the rest at the last fall working. Scatter around the plants, but not too close to them, and work lightly into the soil. A top dressing of barn-yard manure applied early in December or just after the last fall working is a good substitute for the second half of other fertilizers mentioned. Wood ashes kainit, or some other potash fertilizer frequently gives good results when dusted over the surface just before the blooming period.

Mulching.—Reference has already been made to the importance of keeping the fruit clean. Sufficient mulching material for the garden patch may be found about every home; and extensive growers are realizing the fact that, no matter what the practice was years ago, they can ill afford now to put dirty berries on the markets.

Where it may be had, pine straw is a good mulching material. Oat, rye or wheat straw that has been run through the cutter or that has partially decayed answers the purpose very well. Forest leaves thrown into large piles and let alone one year, or until they have well nigh rotted, make an excellent mulch. Cotton-seed hulls is the best of all the materials we have used. Mulching should be deferred until insects have been killed, or driven into winter quarters, by cold weather. Many growers prefer to wait until January or early February. In mulching, the materials must be worked in nicely between and around the plants but not over them. A very light covering over the plants during winter is not objectionable; but, so soon as severest cold is past, the foliage should be left to grow unobstructed. With cotton-seed hulls, it is only necessary barely to hide the soil between the plants and for a short distance on each side along the row. From three to five tons of hulls are required to the acre. The amount necessary of other materials named will depend

much on the condition of the articles used. Aside from keeping the fruit clean, the mulch aids materially in keeping down grass and weeds, in preventing the crusting of the surface soil, and in conserving moisture. The most effective mulch the writer has ever tried was where cotton-seed hulls were applied, as just indicated, during the latter part of January, and, two months later, the walking space (something over two feet wide) between rows was covered about three inches deep with half rotted leaves. Straw would have answered the purpose about as well. Another point worth considering just here is this: When the entire surface between rows is covered with materials named, the soil beneath does not become puddled during wet weather, nor packed hard from daily tramping during picking season.

Harvesting the fruit.—It is not within the province of this bulletin to enter into details as to the manner of gathering and marketing strawberries. This would involve the description of boxes and crates, packing houses, fruit cars, etc.; also a discussion of the best methods of employing and managing laborers, of distribution of fruit among markets and of many other details incident to harvesting and disposing of the crops to best advantage.

The picking season begins about one month from the date of the last killing frost. Near the Gulf the first ripe berries are usually gathered during the latter part of February and early March. In north Mississippi picking does not begin often until late in April. In the southern part of the State the fruit season usually lasts three months, while in the northern part the limit is frequently five weeks. The farther north we go the shorter we find the picking season.

To make the beds do their best, all faulty fruit should be pulled off as soon as practicable. Large quantities of over-ripe fruit exhaust the vines rapidly; hence, it is well to gather the good fruit as soon as it is ripe enough for use. The greater the care exercised in gathering and in handling the fruit the longer it will keep in perfect condition. It bruises berries to pull them from the vines. In picking slip the thumb and first finger below each separate berry and pinch off about one inch of the stem. Do not pour the fruit from one box or basin to another. Handle as little as possible, and keep in a cool place until ready for shipment or for home use. Remember that the best berry market on earth is found at your own table; and that the best strawberries ever flavored with Jersey cream and frosted with sugar are none too good for the members of your household.

Varieties.—Something over 125 varieties of strawberries are now being tested at the College on the Experiment Station grounds. As the majority of these have fruited but once, we cannot give now as satisfactory results as we hope to present at the close of the approaching fruit season.

Below is given brief descriptions of varieties which, upon trial in many sections of the State, have proven reliable for general planting; also a few of the most promising new kinds in the Station collection.

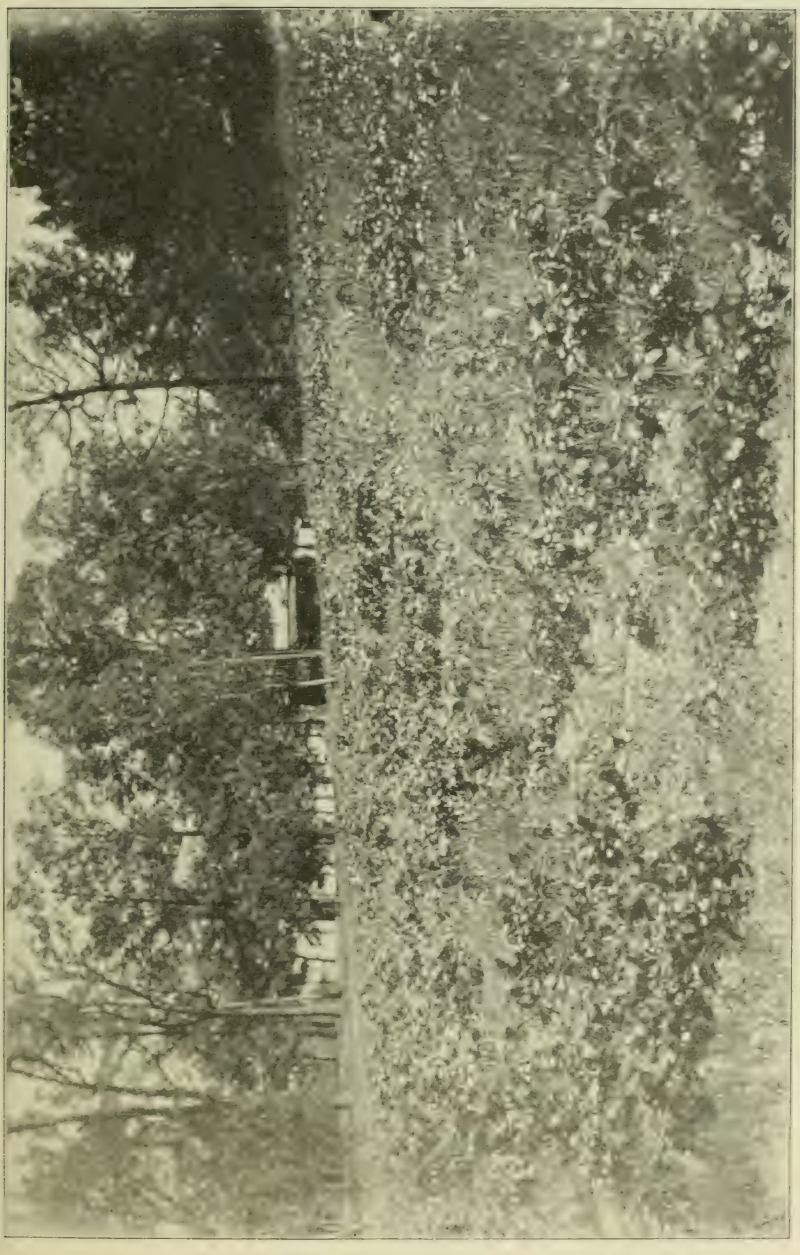
NOTE.—Varieties with imperfect flowers are marked (P). Those with perfect flowers are marked (S). In order to make a variety with imperfect blooms fruitful it must be planted near a variety with perfect flowers.

Hoffman, (S).—One of the first early kinds, which, for years past, has been largely planted for market. It is peculiarly adapted to the South. A rather shy bearer some seasons. Berries conical and perfect in form; medium to large and bright red; a fine shipper. There is usually a light second crop of very large berries. The plant is light green, free from rust, inclined to make many runners; easy to preserve a well matted row.

Cloud, (P).—A southern berry; a few days later than Hoffman. Fruit a rather dull red, medium to large; a good shipper and very prolific. Recently it does not seem to have maintained its former record as to size and perfection of fruit. The plant is vigorous, makes many runners, withstands heat and dry weather well, sometimes rusts badly in thick matted rows.

Lady Thompson, (S).—By far the most prolific variety grown in southern fields for market. Because of its rather pale color and lack of firmness, it is not so attractive and not so good a shipper as some others in the list; but what is lacks in these qualities is more than made up in the number of extra crates of large, well shaped berries. When permitted so ripen well it is deep red and quite showy. It is a good table sort. It begins to ripen early, comes fast, continues a long time in bearing and the berries do not run down in size. The plant is very vigorous, free from rust, will thrive on almost any kind of soil, makes runners freely and stands extremes of heat and cold, wet and dry weather.

Bubach, (P).—A well known late variety. Berries large to very large, sometimes quite irregularly shaped; not so attractive when boxed as kinds named above; fruit lacks firmness; better for the table than for shipping; very prolific, but its season is rather



LADY THOMPSON IN FULL BLOOM, APRIL 5, 1901.

short. The plant is a dark, rich green, free from rust, large and not much inclined to make runners.

Gandy, (S).—Another well known late kind, more desirable in many respects than Bubach. Fruit large to very large; perfect in shape; firm and solid flesh; color deep red; an excellent table berry and one of the best shippers. Not so productive as Bubach, but its fruiting season is longer. It does its best on pretty strong soil. More care is nacessary with Gandy than with kinds above mentioned in preserving a good stand of plants. A very valuable variety for home use and for fancy trade.

Excelsior, (S).—A new berry which is rapidly displacing Michel and Hoffman, the two kinds which, for years past, have contended for first place as early varieties. It is earlier than either of the kinds named. Very productive, of good size, almost globular in shape, not so pretty nor so firm as Hoffman, but a good shipper. It holds up well in size and continues to ripen with the mid season and later kinds. The plant is a vigorous grower, free from rust, makes a good supply of runners, adapts itself to almost any kind of soil, stands extremes of heat or cold, and has remarkable recuperative powers.

Klondyke, (S).—This new berry is of southern origin. It is classed among the late varieties, but begins to ripen much earlier than Gandy and Buback. It is much more prolific than either of them, and will doubtless drive both of these good old kinds from the field. The fruit is large, regular in shape, very firm and a fine shipper; color is deep red to the center; flavor excellent. It continues to fruit with the very latest kinds and the berries hold up large to the end of the seasou. The plant is a very satisfactory grower, makes plenty of runners and is free from disease.

Hunn, Clarence, Noble, Gardner, Brunette, Nick Ohmer, Gladstone and **Haverland,** in the order named, promise to contend for honors with the varieties that have heretofore held first places with Mississippi strawberry growers. The following pictures, made during fruit season of 1901, show the typical shape of the several varieties named, as produced on the Station grounds at the Mississippi A. and M. College.

Gardner

Haverland Hunn

Gardner

Haverland Hunn

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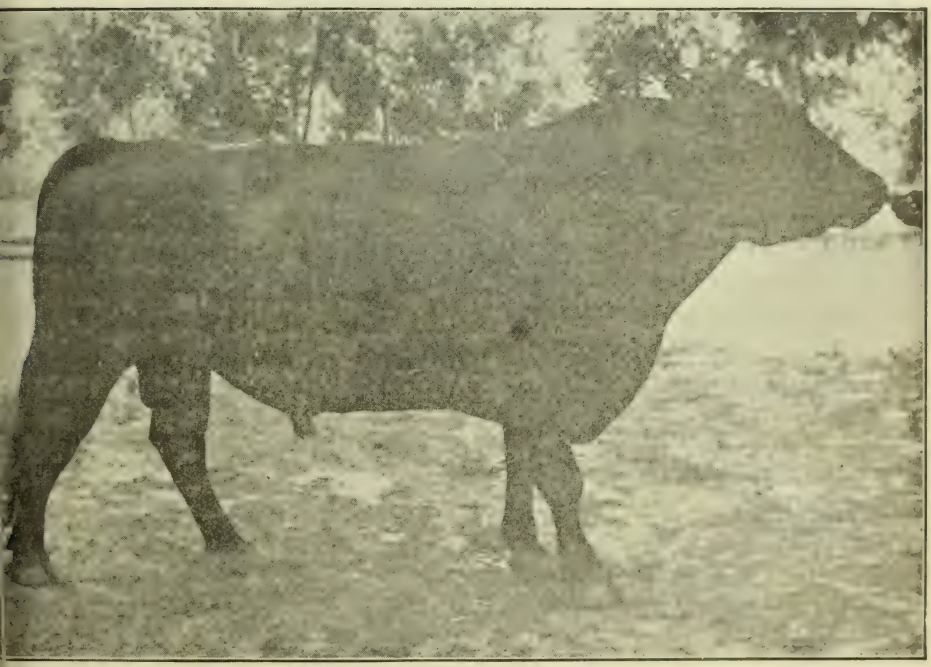
BULLETIN No. 76.

BEEF CATTLE.

By W. L. Hutchinson and E. R. Lloyd.



Emerado No, 25,180, Angus Bull at head of Station Herd.

AGRICULTURAL COLLEGE, MISS.

JULY, 1902.

MISSISSIPPI STATIONERY CO., YAZOO CITY.

BEEF CATTLE.

Introduction.—The present system of farming in Mississippi fails to make profitable use of all the land on the farm. It permits the most excessive washing of surface soils, and in consequence, the cultivated area becomes less productive each year, while the gullies and washes get wider and deeper and more numerous. Grass is not wanted and is either treated with indifference or as an enemy. The money received for the cotton crop is spent for supplies, for work stock, and for feed because not enough of these things are grown on the farm to supply the demand. The present system will not permit of paying good wages for labor, and labor that is poorly paid is generally unsatisfactory.

The growing of live stock on the farm has an important bearing on its productiveness and increases very greatly the opportunities for using all parts of it profitably. By furnishing a means for disposing of the crops grown, live stock encourages diversification and makes it easy to practice rotation without "losing the use of the land when it is occupied by restorative crops."

Under the present system one dollar per acre for the entire area is very good rent for the average farm. A few will rent for a little more, while many will not rent for so much. This condition, apparently, is largely due to the fact that no returns whatever are gotten from large areas, while the average productiveness of other large areas is too small for any profit.

The beef herd.—The work with live stock, which the Station has in progress, is designed to ascertain if the present system of cotton farming cannot be improved by growing such live stock as are needed on the farm and also, a limited number for sale and, by so doing make the best use of all the land on the farm and keep the cultivated area productive. The work with beef cattle was begun in 1897.

In establishing the herd a registered Aberdeen Angus bull and native cows have been used, and of the twenty-four cows purchased (See Fig. 2), four were native grade Red Polls, and twenty common native cows, some of them of the best type, some of the poorest and the others between these two extremes. The four grade Red Polls

were purchased in September, 1897. Five of the native cows were purchased in January, two in March and thirteen in September, 1898. There has also been in the herd a grade Angus heifer that had been used for experiments with Texas fever.

Two Angus bulls have been in use. The tuberculin test indicated that the first bull might have tuberculosis so he was sold. He cost $150.00 in Missouri and was sold for $61. 00.

Foundation Herd.

The twenty-five cows cost $443.70, the bull, including $10.00 freight, cost $135.00, making the total cost of the herd, $678.70. The four grade Red Polls cost $25.00 each; two of the natives $14.00 each; the cost of the others being from $16.00 to $17.00 each.

Management of the herd.—The cattle have been kept at pasture during the summer and fed during the winter, principally on cottonseed meal and hulls. The feeding period has lasted from 135 to 150 days, thus giving a grazing period of only about seven months. The cattle have not had access to stalk fields nor canebrakes, and cotton was grown on the cleared land in the pasture in 1897.

The calves have all been allowed to run with their dams and to have all the milk, as soon as they could use it. Where good pasture is provided and the calves allowed to run with their dams, it is an easy mattter to have the calves weigh over 500 pounds when they are twelve months old. On account of having a fewer number of cattle the first year the pasture was better than it has been any succeeding

year. The gains made by the calves that year are shown by the following:

STEERS.

No. 18, dropped in March, weight at 12 mos. old, 674 lbs;
No. 24, dropped in November, weight at 12 mos. old 515 lbs;
No. 30, " " March, " " " " " 550 " ;
No. 2, " " October, " " " " " 540 " ;
No. 1, " " " " " " " " 640 " ;
Average weight for steers at twelve mos. old 589 lbs.

HEIFERS.

No. 19, dropped in February, weight at 12 mos. old, 536 lbs;
No. 15, " " May, " " " " " 546 lbs;
No. 3, " " October, " " " " " 480 lbs;
No. 92, " " " " " " " " 580 lbs;
No. 18, " " November, " " " " " 485 lbs;
No. 21, " " February, " " " " " 524 lbs.
Average weight of heifers at twelve months old, 525 lbs.

The largest steer at twelve months old weighed 674 pounds, and the largest heifer 580 lbs.

Many of the cows dropped calves, sired by Jersey or native bulls shortly after we bought them. Only two of these native calves were kept until they were two years old; the others were sold when they were from six to twelve months old. The native cows were all sold during the summe. of 1901, so that we now have a herd of grade Angus cattle.

SALES FROM THE HERD.

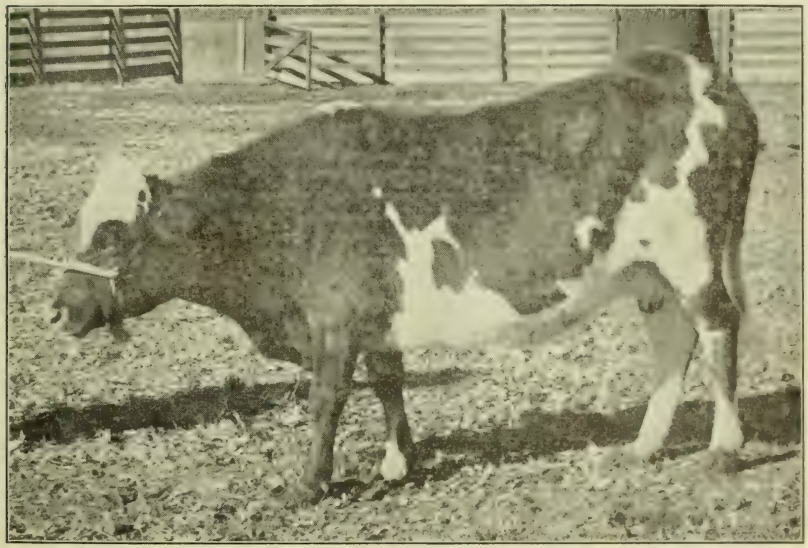
April 25, 1899, 2 yearlings,	$ 32 40
February 13, 1900, 9 yearlings,	140 76
April 19th, 1901, 4 two-year-old steers,	192 34
January 15th, 1901, 3 cows,	57 50
May 1st, 1901, 22 cows,	462 00
Total sales	$885 00.

INVENTORY OF HERD.

The herd now consists of forty-one young grade animals and the bull. Placing an estimate of four cents a pound on the young steers and a fair price for the young cows and heifers, the forty-one young animals are worth $1012 40
The bull cost and is easily worth 135 00

Total value of herd $1147 40

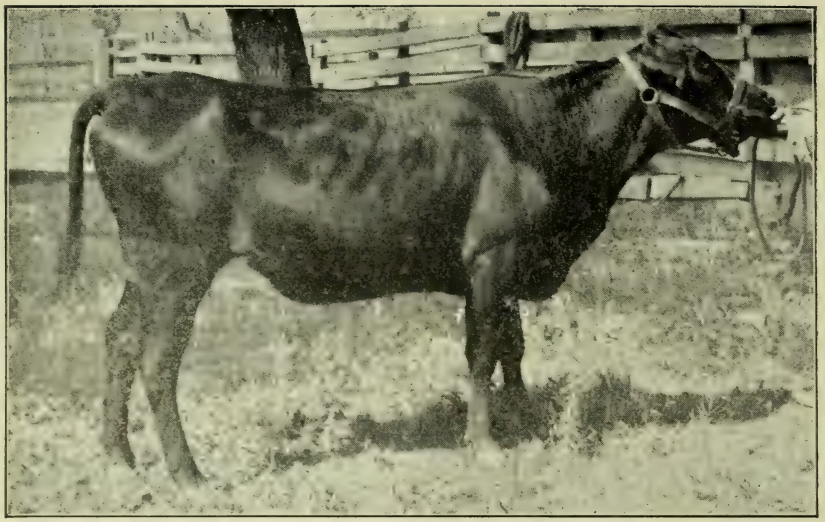
Pure bred-sires.—Cattle that show the colors and qualities of the beef breeds, sell better than those that do not, and this is sufficient reason for using a bull of one of the beef breeds whenever the object is to produce beef animals for sale. Buyers are of the opinion that pure-bred beef animals and, also, the grades of pure-bred sires, produce the best quality of beef as well as the greatest number of pounds of dressed meat per hundred pounds live weight. It is a fact that animals vary greatly in the percentage of dressed meat they will yield. Common cattle with bad treatment dress from 40 to 50%, while pure-bred and grade cattle with better treatment dress from 55 to 65%. Some few dress 67 to 69%.



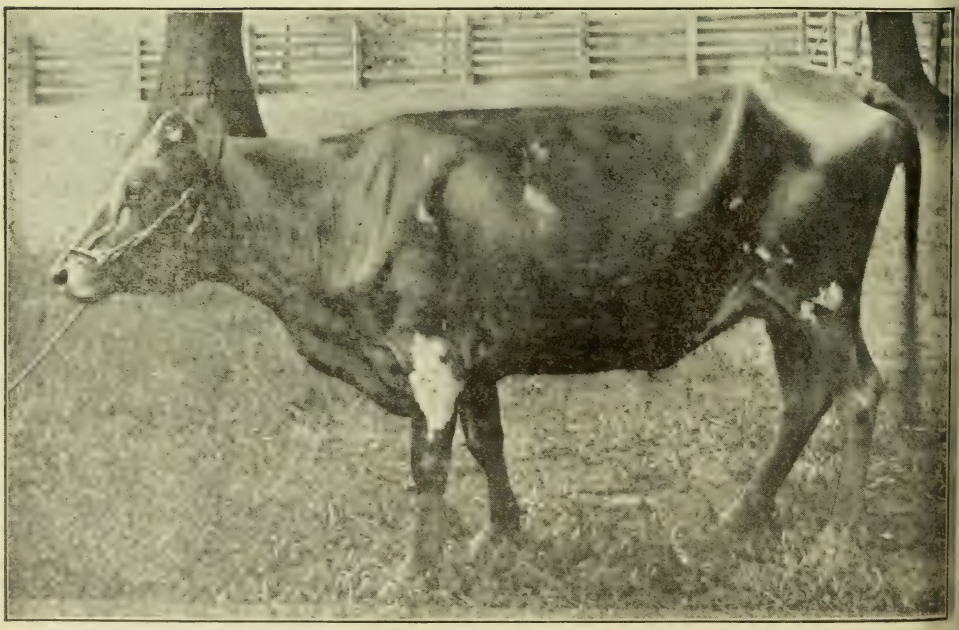
Native Cow, dam of heifer in fig. 4.

As before stated the Station is using an Angus bull. The Angus cattle are black and do not have horns. None of the grade calves in the Station herd have horns and nearly all of them are black. They all show their Angus breeding.

Grade vs. common steers.—It is often claimed that all that is necessary to make the raising of beef cattle profitable in Mississippi, is to use on our native cows, pure-bred bulls of the beef breeds. While our work with beef cattle is only begun still the re-

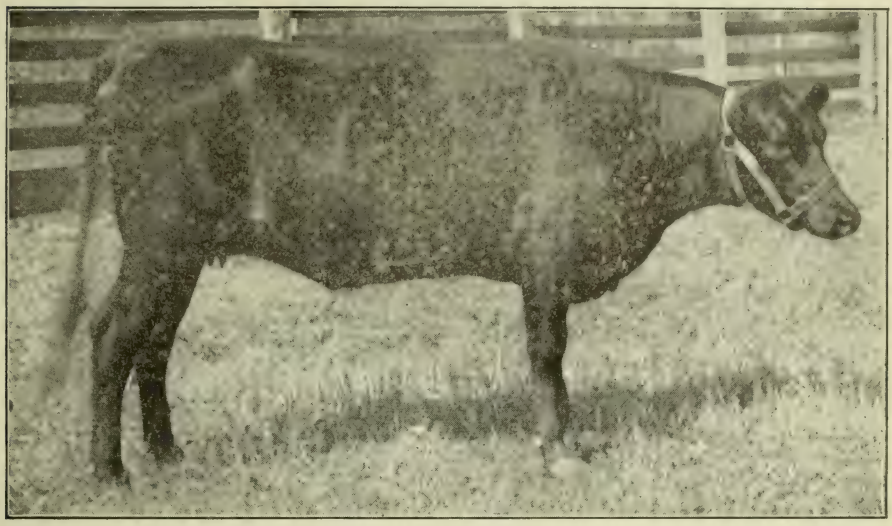


Grade Angus heifer, two years old. (Fig. 4)



Native Cow, dam of heifer in fig 6.

sults are such that we feel warranted in saying that while it is desirable and best to use sires of the beef breeds, this alone will not be sufficient. Feed for the winter months is a very much more important item and so is Texas fever.



Grade Angus heifer at two years old. (Fig. 6.)

Two grade Angus calves and two native calves were given the same treatment until they were two years old, when they were shipped and sold in the St. Louis market. When sold the average age of the two native steers was two years and seven months and, of the grades, two years and one month. The buyers pronounced the natives as fat and the grade Angus as half fat. All the steers sold for the same price per pound, which was 4 3-4 cents live weight. The average weight of the two grades was 970 lbs., while the natives, which were a little older, averaged 1067 lbs. The four steers sold for $192 34.

The treatment given these steers was to allow them to run with their dams at pasture for the first summer. The following winter they were fed so as to make them gain in weight and put back on pasture April 15th. The following November they were put in the feed lot and fed all they would eat until they were sold April 17th. In finishing these steers they were fed a mixture of cottonseed meal and corn chops for grain, and cottonseed hulls for hay.

The native steers dressed 60%, the grades, 60.4%. The natives made as good gains as the grades and gave as large amounts of the choice cuts. The data obtained in regard to the carcasses is given in the following table :

Table Showing Data in regard to the Carcasses of two Native and two Grade Steers.

Description of cut	Largest Grade Angus steer.		Smallest Grade Angus steer.		Native Brindle Steer.		Native White Steer.	
	Wt. Lbs.	% of carcass	Wt. Lbs.	% of carcass	Wt. Lbs.	% of carcass	Wt. Lbs.	% of carcass
Round	149½	24.17	133	24.11	151	22 50	137	23.22
Loin	131	21.18	122½	22.21	165	24.59	131	22.20
Rib	56	9.05	51	9.25	64	9.53	55	9.32
Chuck	121	19.56	107	19.40	127	18.93	116	19.66
Flank	21	3.39	20	3.62	22½	3.35	20	3.39
Plate	78	12.61	64	11.60	84½	12.59	75	12 71
Shank	62	10.02	54	9 79	57	8.49	56	9.49
Hide	67	------	67	------	70	------	70	------
Tallow	63	------	63	------	81	------	81	------

Feeding calves with dam.—It takes more feed to maintain large animals than it does smaller ones. When young animals are fed, very little is required for support and much of what they eat goes to make gain in weight, hence it is much easier to feed young animals at a profit than it is older and heavier ones.

Four calves, three of which were dropped in August and one in July, were fed during the winter as well as being allowed the milk of their dams. The feeding began November 10th and ended April 12th. The following shows the results :

No. 32, dropped August 25th, weighed at 7 1-2 mos. old, 395 lbs ;
No. 64, " " 16th, " " 8 mos. old, 400 lbs ;
No. 93, " " 4th, " " 8 1-4 mos. old, 445 lbs ;
No. 31, " July 22nd, " " 8 2-3 mos. old, 435 lbs.

The average weight of the four calves was 419 lbs. The feed which they had eaten cost $20.07. The feed which their dams had eaten for the same period cost $36.00. The gross weight of the four calves was 1675 lbs. Average daily gain 1.73 lbs.

Three calves with their dams but without feed made an average daily gain of 1.54 lbs.

Pasture.—The Station began its work with beef cattle with a cotton field and a piece of woods for a pasture. On the cotton land was more or less Johnson grass. Oats were sown on this land in the early fall and the oats and Johnson grass together, furnished excellent pasture the following summer for the limited number of cattle that were on the land. The breeding cattle were in fine shape and the young animals made large gains. The pasture has been too heavily stocked since that time and there have been periods when the grazing was not sufficient to keep the young animals from losing in weight.

In the pasture field are five acres of good valley land the balance being good average upland for this section and is practically free from washes. The small area of valley was put in bermuda grass and white clover. With a large number of cattle constantly on the land we have not, as yet, gotten very satisfactory grazing on the hill lands. The bermuda and white clover in the valley and lespedeza on the upland have furnished the principal grazing. Other grasses that have furnished some grazing are red top, orchard grass, large water grass, turf oats, and hairy vetch.

In establishing a pasture care should be taken not to overstock it at any time and to be sure of this more than one field should be available in order that the cattle may be changed whenever it is apparent that they are grazing certain grasses too closely. Bermuda, white clover, large water grass and lespedeza are the only plants that have stood heavy constant grazing well. If cattle are changed at the proper time and with sufficient frequency, Johnson grass, alfalfa and melilotus may all be made to furnish good grazing. Good pastures can be provided for a period of about seven months, during which time cattle will make satisfactory gains and if the transaction begins and ends with this grazing period good returns may be had for the use of the land. Stalk-field pastures are often the best we have during the year and with these and an early spring pasture of oats and vetch, the grazing period may be extended somewhat longer than seven months. Some of our young animals have gained as much as 400 lbs during the grazing period, others have gained from 200 to 300 pounds. Our conditions have not been such as to enable us to determine the average gains that should be gotten during a pasture period, but it should not be less than 200 lbs. for each animal. Just how many acres of pasture should be allowed each animal will depend on the quality of the pasture, but pastures and climate probably do not offer any serious difficulties to growing good cattle at a profit in this State.

Feeds and feeding.—Abundant feed for cattle during four or five months of late fall, winter and early spring is a most important matter. Beef steers will market almost an unlimited amount of feed but not at a very high price. The farmers of the corn and alfalfa sections of the country depend on beef steers and hogs to market much of their crop. They will feed a steer half a bushel of corn a day and the necessary roughage and are satisfied with a gain of 5 lbs. for each bushel of corn fed. If they can market their alfalfa hay at $5.00 a ton by feeding or otherwise they have made good profit on their land.

The man who does not own some land and who does not have something or who does not wish to grow something for cattle to eat has no use for cattle. The function of live stock on the farm is to convert grain and grass and roughage, that are produced on the farm, into meat or other lives-tock products. As a people we are accustomed to high priced feeds and to buying large amounts of grain. It is equally true that our farmers depend on the oil mills to buy their cotton seed and they take whatever these mills offer. There is a demand for cattle on the farms to eat the cotton seed or the meal and hulls after the oil is extracted. It is desirable to grow more restorative crops and with these and manure to make the land more productive. Oil mills do not pay high prices for seed. Good cattle doubtless would give as good and perhaps better returns for them and leave the fertilizing elements on the farm as an additional profit.

In determining the relative values of feeds the results obtained by this Station show that a ton of cotton seed will produce about one-sixth more beef than a ton of corn, and a ton of cotton-seed meal will produce twice as much. Cowpea hay and Johnson-grass hay are about equal in value. One and a half pounds of corn stover are about equal in value to one pound of cowpea hay. The cotton-seed hulls that we have been using this season are nearly equal in value to good Johnson-grass hay—12 lbs. of the hulls giving as good results as 10 lbs. of hay.

The Station herd is handled with a view of obtaining information. We have not made any effort so far to produce feed for the herd, except such feeds as we wished to try and which the local market could not supply. To winter the breeding herd on cotton-seed meal and hulls has cost for feed for each animal from $6.37 to $8.00. In 1897–98 it cost $7.00 per head; in 1898–99, $6.37; in 1899–00, $7.60; in 1900–01, $8.00; in 1901–02, $7.95. Since the first cattle were bought the total cost for feed for the breeding herd has been $754.31, and for the entire herd, $1257.31.

The feed consumed by the four steers, that brought $192.34 in St. Louis, cost $105.15.

Other matters of interest in regard to feeding the herd are given in the following table:

DATA IN REGARD TO FEEDING THE BEEF HERD.

Number of calf	When dropped.	Dam.	Cost of feed for calf	Cost of feeds for dam until next calf.	Total cost of feed calf and dam.	Weight of calf.	Estimated value of calf.	Remarks
				$7.00				
Native	------	Large Red Poll	------	20.37	$13.37	------	$15.40	------
24	11-22, '99	Large Red Poll	$23.25	57.60	30.85	930	37.20	Steer
35	9-28, '00	Large Red Poll	10.76	8.00	18.76	560	22.40	Steer
18	3-13, '99	Deep Red Poll	26.25	20.97	47.22	1015	48.22	------
43	8- 4, '00	Deep Red Poll	15.36	8 00	23.36	800	------	------
Native	3-20, '98	Poll-Devon	7.56	14.37	18.96	------	17 00	------
000	2-24, '99	Poll-Devon	13.88	9.6	23.48	------	30.00	Heifer
48	11-14, '00	Poll-Devon	5.42	8.00	13.42	450	20.00	Heifer
18	8-20, '01	000	------	7.95	7.95	280	10 00	Heifer
20	3-20, '99	Poll Jersey	26.25	20.97	47.22	------	43.93	Steer
44	7-26, '00	Poll Jersey	5.42	8.00	13.42	585	25.00	Heifer
Native	5-22, '98	Chiles-roan	26.25	10.57	36.82	------	48.66	Steer
2	10- 3, '99	Chiles-roan	23.25	7.60	30.85	900	36.00	Steer
29	9-22, '00	Chiles-roan	5.42	8.00	13.42	525	20.00	Heifer
94	6-14, '98	Chiles-pale-red	10.60	10.57	21.17	------	15.00	Heifer
67	10-15, '99	Chiles-pale-red	9.06	7.60	16.66	620	30.00	Heifer
13	4-22, '01	67	------	7.95	7.95	------	12.00	Heifer
27	9-22, '00	Chiles-pale-red	10.76	8.00	18.76	585	23.50	Steer
41	7-31, '00	94	8 30	8.00	16.30	------	25.00	Heifer
95	3-11, '98	Chiles-red-white	15.16	10.57	25.73	------	15.00	Heifer
15	5- 8, '99	Chiles-red-white	21.01	7.60	28.61	750	30.00	Heifer
40	7-22, '00	Chiles-red-white	5.42	8.00	13.42	540	20 00	Heifer
37	7-27, '00	95	10.76	8.00	18.76	410	16.40	Steer
1	10- 2, '99	Speckled Halbert	23.25	13.97	37.22	1110	44.40	Steer
64	8-16, '00	Speckled Halbert	15.36	8.00	23.36	720	28.80	------
Native	4- 1, '98	Red Halbert	7.56	6.37	16.57	------	22.00	------
4	10- 5, '99	Red Halbert	23.25	7.60	30.85	1110	44.40	Steer
47	10 23, '00	Red Halbert	5.42	8.00	13.42	485	20.00	Heifer
Native	3-25, '98	Spotted Sanders	10.20	10.57	20.77	------	22.32	------
3	10- 9, '99	Spotted Sanders	17.01	11.60	28 61	------	30.00	Heifer
32	8-25, '00	Brindle S.	15.36	26.17	41.53	720	28.80	Steer
19	10-27, '98	Black T. F.	7.60	13 37	20.97	810	40.00	Heifer
17	3-16, '01	No. 19	------	7.95	7.95	------	10.00	Heifer
78	11- 4, '99	Black T. F.	17.01	7.60	24.61	790	30.00	Heifer
46	10-13, '00	Black T. F.	10.76	8.00	18.76	470	18 80	Steer
34	8- 2, '00	No. 19	5.42	8.00	13.42	525	25.00	Heifer
21	2 17, '99	Solid-red W	2.64	13.97	16.61	------	15.72	------
25	7-25, '00	Solid-red W	5.42	8.00	13.42	640	25 00	Heifer
9	2-15, '00	Red Muley W	2.64	17.97	20.61	------	15.78	------
26	8 7, '00	Redneck W	5.42	21 97	27.39	525	25.00	Heifer
23	12- 3, '99	Bramah	23.25	17.97	41.32	880	35.20	Steer
36	9-27, '00	Red-white Brindle	5.42	21.97	27.39	520	20.00	Heifer
11	4- 8, '99	White	2.64	13.97	16.61	210	15.54	------
66	7-25, '00	White	7.55	8.00	15.55	670	25.00	Heifer
16	11-28, '98	Blue Speckled	2.64	13.97	16.61	------	13.14	------
22	12-10, '99	Duncolor Spots	17.01	13.97	30.98	900	35.00	Heifer
49	11-20. '00	Duncolor Spots	5.42	8.00	13.42	525	20.00	------

DATA IN REGARD TO FEEDING THE BEEF HERD.

Number of calf	When dropped.	Dam.	Cost of feed for calf	Cost of feeds for dam until next calf.	Total cost of feed calf and dam.	Weight of calf.	Estimated value of calf.	Remarks
17	2-17, '99	Red-white-line	2.64	13.97	16.61		13.50	
28	8- 7, '00	Red-white-line	7.55	8.00	15.55	660	25.00	
13	4-15, '99	Bell Cow	2.64	13.97	16.61		12.30	
65	7-22, '00	Bell Cow	8.30	8.00	16.30	550	20.00	Heifer
14	4-26, '92	"Holstein"	2.64	13.97	16.61		10.44	
31	7-22, '00	"Holstein"	15.36	8.00	23.36	815	32.60	Steer
5	10-14, '99	Red Muley	17.01	13.97	30.98	590	20.00	
14	4-12, '01	No. 5				275	10.00	
63	8-24, '00	Red Muley	5.42	8.00	13.42	540	20.00	
10	1-25, '99	Old-pale-red	26.25	13.97	40.22		51.53	
45	8-21, '00	Old-pale-red	5.42	8.00	13.42	530	20.00	
12	10-13, '97	Grade S. H.			30.00		30.00	Heifer
10	10-26, '01	No. 12		7.95	7.95	260	10.00	

The feed and pasturage for the dam should very properly be charged to the calf and we have charged each calf with the keep of its dam until the next calf was dropped. An examination of the data in the table will show this to be a very important matter in handling a herd of beef cattle. We have only tried one plan of handling the breeding herd and that is to pasture them in summer and feed on cotton-seed meal and hulls during the winter. If a calf could be had from each cow each year and every calf could be raised, each calf would only have to stand a feed bill for its dam of about $8.00. But of course no such results can be secured. As the work progresses we will secure additional data which will indicate what the average results will be. Up to this time our results will necessarily show abnormally high charges on this account, as we made no effort to have this charge a minimum one our principal effort being to get a grade herd with as little delay as possible. It is very well, perhaps, that we started the Station herd, as we did as it shows plainly some things that should not be done, as well as some things which should be done. Every effort should be made to secure a calf each year and to raise it and any neglect in this line is sure to be felt in lessening the profits. Our results show that it is better to start with a herd in the spring rather than in the fall and to have the cows drop calves at once.

These common calves can be made to pay all expenses until the grade calves are being dropped, otherwise the first lot of grade calves will have very high feed bills for their dams. The results also show that it is just as important to cull the unprofitable dams from a beef herd as it is from a dairy herd. A cow that will not breed regularly and that does not give enough milk to raise a good calf, will not be a profitable cow if the calf must depend on the dam for its support while young. Cows that make good mothers and that drop a calf each year are the ones that are wanted in a beef herd. Shy breeders and young heifers that have not been bred are not desirable in establishing a herd of grade beef cattle.

Manures.—The manure from animals fed on cotton seed or its products is of the very highest value. Cotton seed and cotton-seed meal are about the only feeds that are ever used directly as fertilizers and that are worth their market price for this purpose. The liquid and solid excretions of animals contain most of the fertilizer ingredients in a feed and it seems that stable manure should be one of the valuable products on every cotton farm.

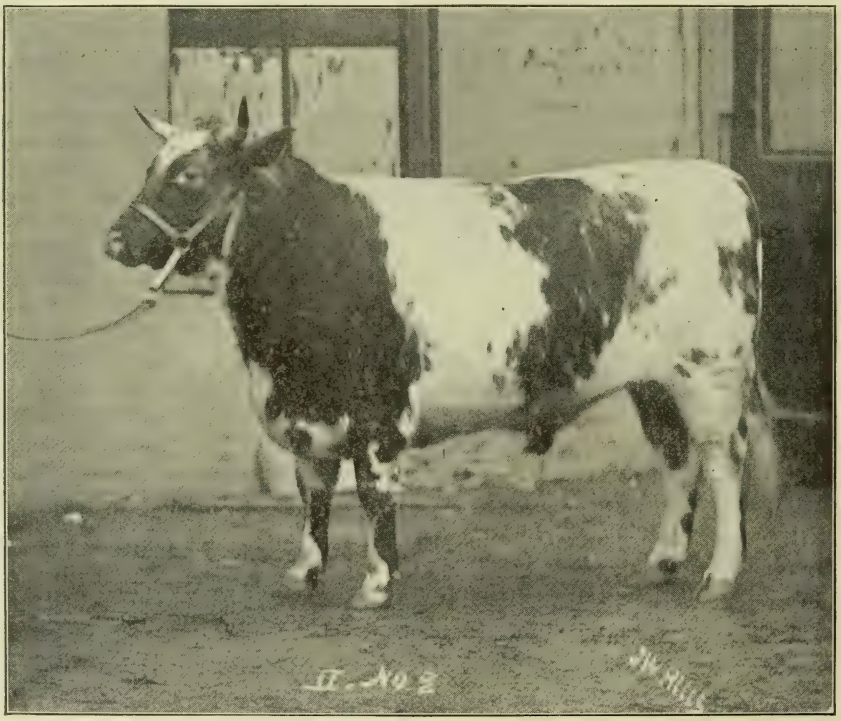
The beef cattle of the Station are fed in a barn, but they are never confined in it being allowed to go in and out as they please. Leaves or other bedding are used in sufficient quantity to absorb the urine and keep the barn dry and comfortable, and in this way we get about one ton of manure to each animal during the winter months. Six steers in four months produced 16,160 lbs. or a little more than eight tons. Eighteen animals produced during the winter 37,141 lbs. The herd produced, during the winter of 1901–02, 109,000 lbs. or a little over 54 tons.

Blight was very bad in cotton last season. On the Station plats everything blighted and shed the leaves except the plat fertilized with stable manure. The manure not only prevented blight but it gave a better yield per acre and improved the staple to an appreciable extent. Small applications of manure have proven very beneficial to cowpeas, alfalfa and bermuda. Manure improves land in a very decided manner and is more lasting than commercial fertilizers. For additional information on this subject see bulletin 60 and 66 of this Station.

Diseases.—For more than a third of a century many of our farmers have tried to grow beef cattle but the death-rate in their herds has sooner or later put them out of business. Their cattle have died

with "Murrain," or with "bloody urine," which, perhaps was nothing more nor less than Texas fever in our native cattle that for one reason or another failed to become immune to this desease when young. It is very probable that Texas fever in our native cattle has done more to discourage the production of beef in this State than all other things combined. When the effects of ticks, and other insects that may carry the germs of Texas fever, were ascribed to bermuda grass, "hollow horn" and "hollow tail", conditions were not very favorable to making money in the cattle business.

The Station has lost two or three animals from Blackleg and the disease has appeared in many other places in the State. This disease can be controlled by vaccination. See other bulletins of the Station for more detailed information concerning these diseases.

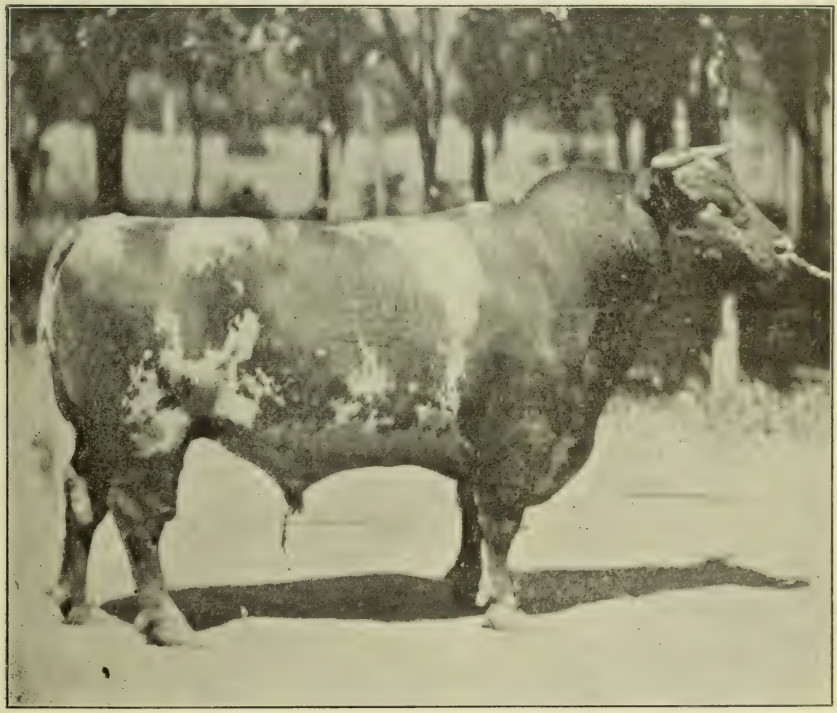


Grade shorthorn steer, age 1080 days, weight 1950 lbs.

Finished steers.—The best beef cattle bring about three times

as much per pound as the poorest. There is no profit in raising the poorest and the best cattle are not made by neglect and semiperishing process. To have good beef cattle they must be treated well and fed liberally.

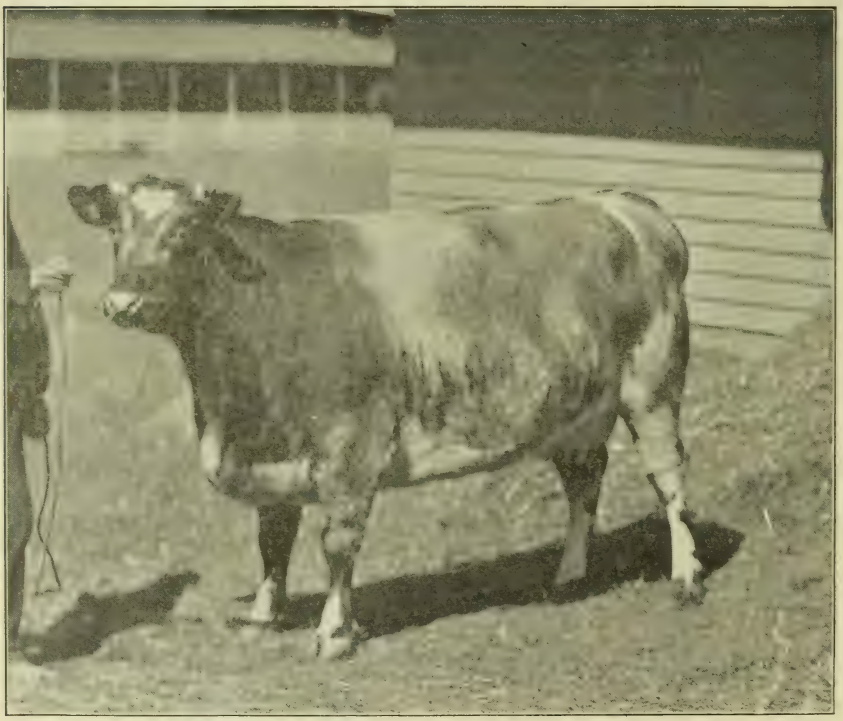
Even the best Mississippi cattle are sent to market only half fat. Usually they are only fed from 90 to 120 days and this will not finish a steer, unless he is fat to begin with. It takes too much feed to make a pound of beef for it to be profitable to feed animals that when sent to market will not bring more than three or four cents a pound. In finishing animals for the market the gains made rarely ever pay for the feed consumed, and, in consequence the increased value of the entire carcass, after being fed, over what it was when the animal was put on feed, must represent the profits, if any, in finishing steers for the block.



Shorthorn Bull, St. Valentine.

Breeds of Beef Cattle.

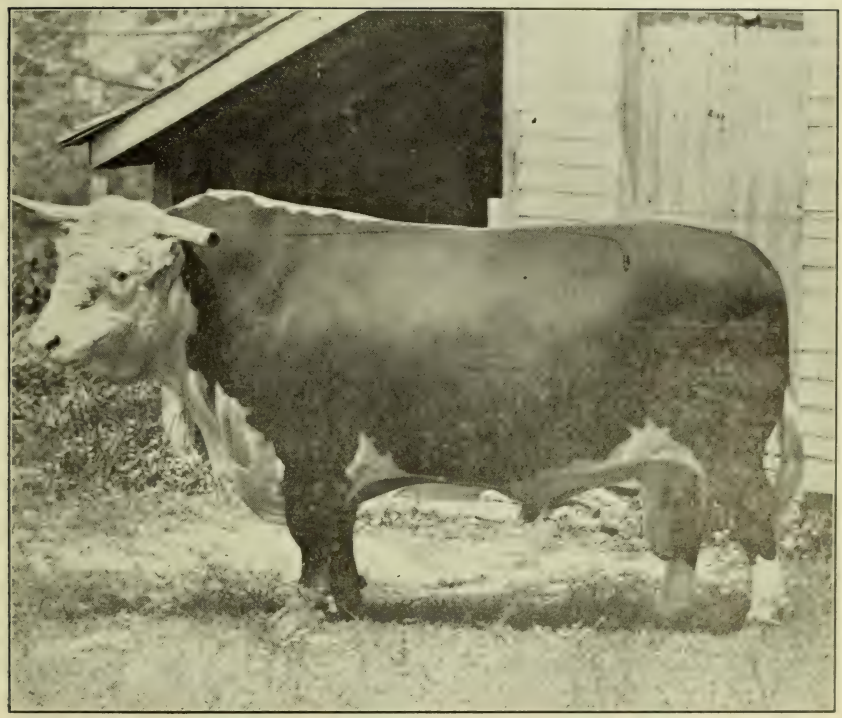
Shorthorn.—This breed of English cattle in the course of its development has been represented mainly by three family types. The Bates, noted for style and finish, with a combination of milk and beef qualities; the Booths, famous for wide backs, length of quarters, deep flesh and beefing attributes; the Cruickshanks, or Scotch family, is noted for heavy weight, with low, broad, deep forms, heavy flesh, vigor and early maturity.



Shorthorn Cow, Sally Girl.

The shorthorn of to-day should reflect a blending of the three family types in possessing a beef form, good milking qualities and a vigorous constitution.

The common colors are red, white and roan. In size the shorthorn ranks among the largest of all breeds.



Hereford bull, Columbus, No. 51,875, age 8 years.

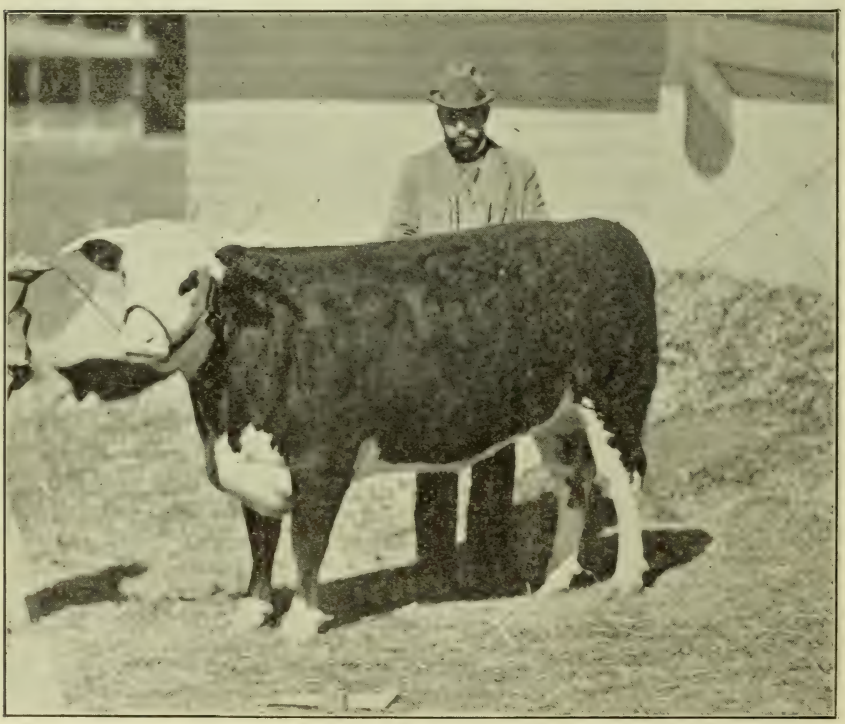
Hereford.—This breed derives its name from its native district in England.

The most popular color and markings are dark claret or cherry, white face, throat, chest, legs, belly, twist and small stripe of white on neck and before shoulder. The horns are medium to long, white and generally turning outward.

This breed represents the type that is suitable for the largest production of beef as it is low set and broad, heavy in fore quarters, full, deep chest, level wide back, wide thick loin and quarters. The form

represents that which is associated with a strong constitution, vigor and prepotency, and one of the strong points of the breed is their grazing attributes. The Hereford probably has no superior on the range.

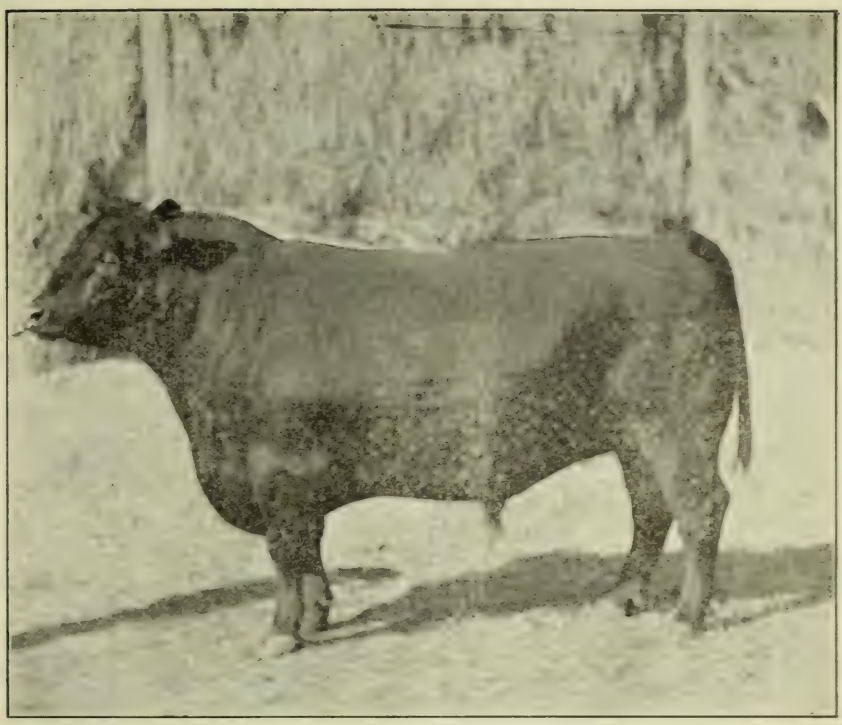
The cows of this breed give only milk enough to raise a very thrifty calf.



Hereford Cow, Benison, age 2 years.

Aberdeen Angus.—The characteristic color of this breed of Scotch cattle is black without any white, except an occasional spot on the udder. The type of the breed is favorable to the production of the best quality and largest quantity of meat.

Smoothness is a leading feature. This breed is noted for its symmetry and quality and for the eveness with which the flesh covers the carcass.

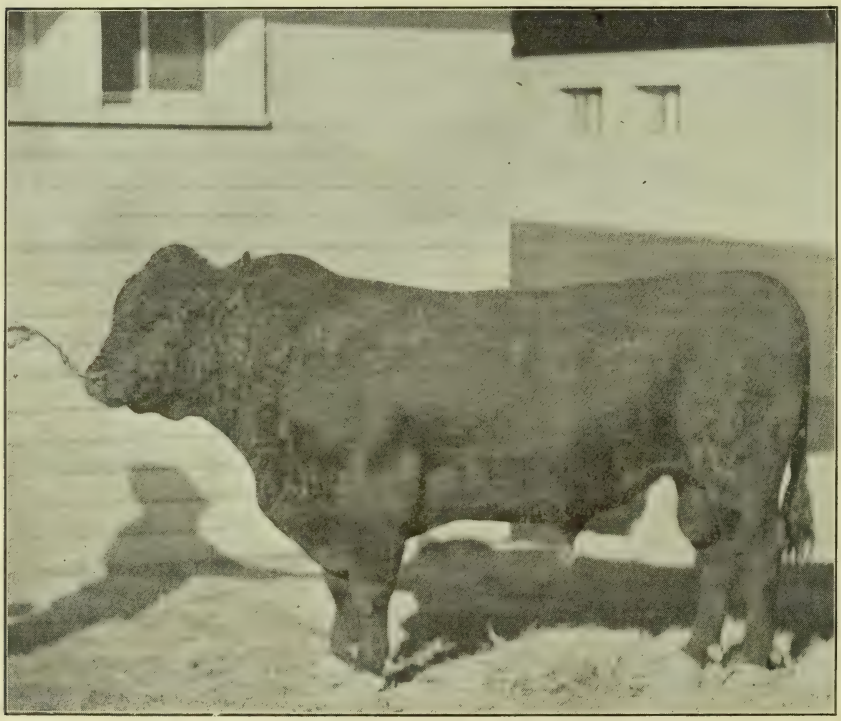


Aberdeen Angus Bull, Heather Lad, 19,049.

Aberdeen Angus, Cow Lady of Meadow Brook, 21,466.

The head is hornless without any appearance of scurs, and it should be surmounted by a sharp poll, neck free from loose skin with a strong shoulder fitting close to body and not rough at the top. The general form is cylindrical, covered with even depth of mellow flesh and hide that is pliable yet not thin and covered with fine black hair.

The cows of this breed give only milk enough to raise a good thrifty calf.

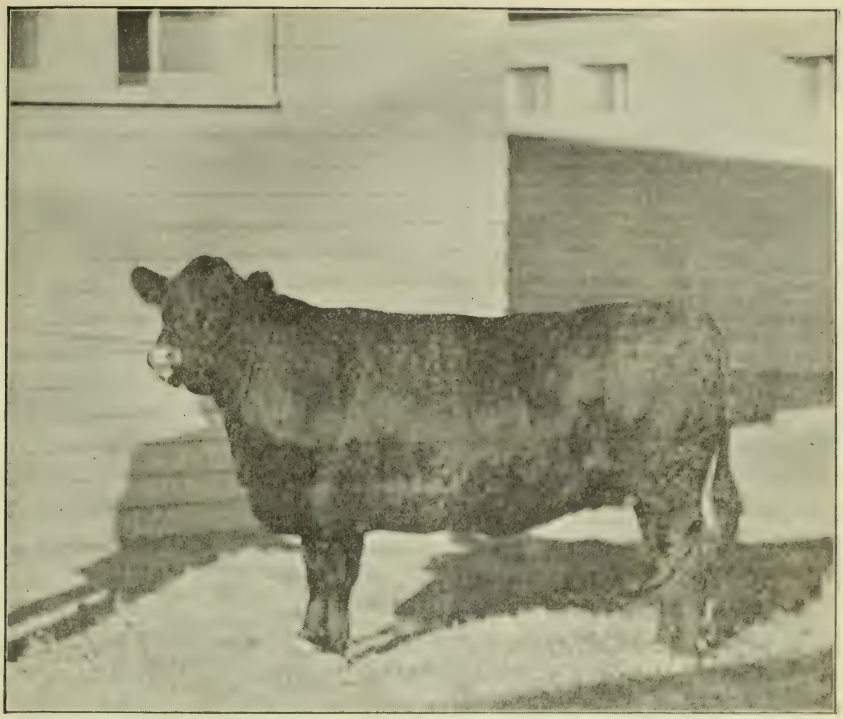


Galloway Bull, Gen. Watts, 12,483.

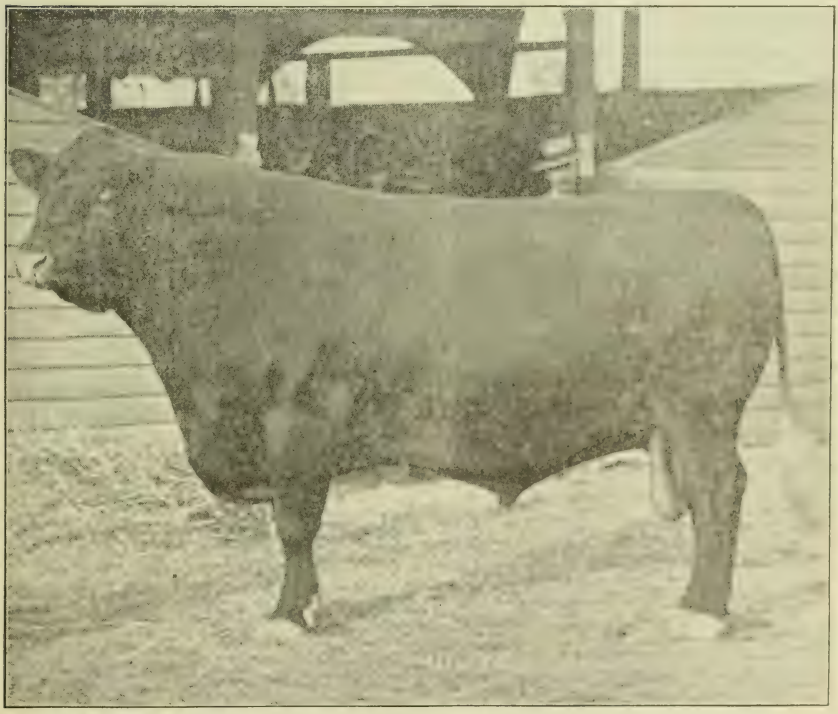
Galloway.—This breed derives its name from its native district in Scotland, is black in color, with brownish tinge in winter. No white is admissable except on udder or below the under line. They have no horns.

The type represents a form that is thick, close to the ground and symmetrical, with long wooly and thick coat of hair. This breed is noted for hardiness and strength of constitution.

The cows, as a rule, are very poor milkers.

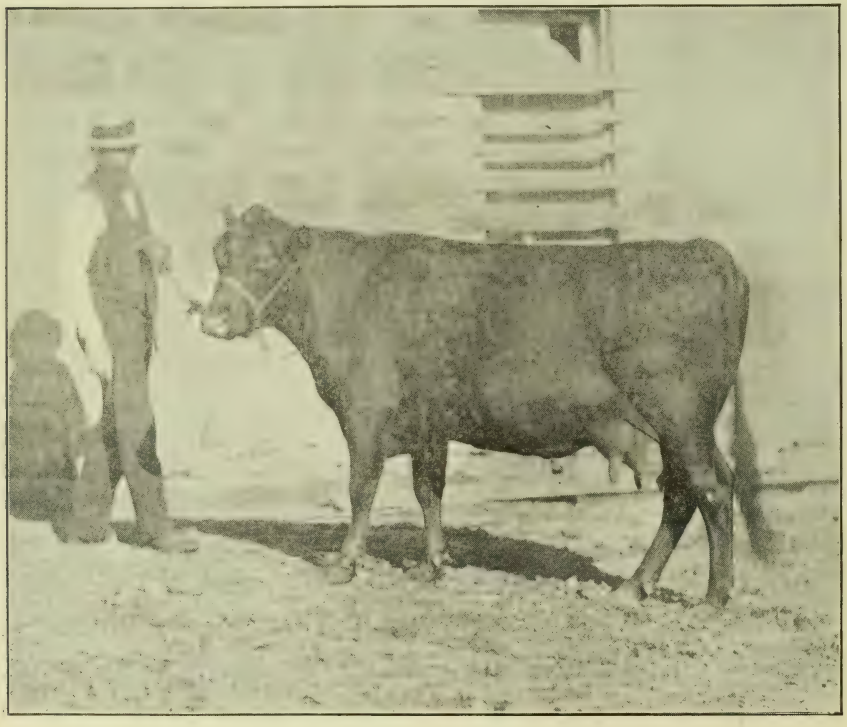


Galloway Cow, Leora P. 12,590.



Red Polled Bull, Wildroy, 1105.

Red Polled.—This breed which originated in England, have been polled and red in color and otherwise possessed the type characteristics which now identify them for more than a century. The type of the breed should represent a high combination of beefing qualities with utility for dairy purposes. This means a form that carries a covering of flesh and is especially developed in those parts which produce the best quality of meat.

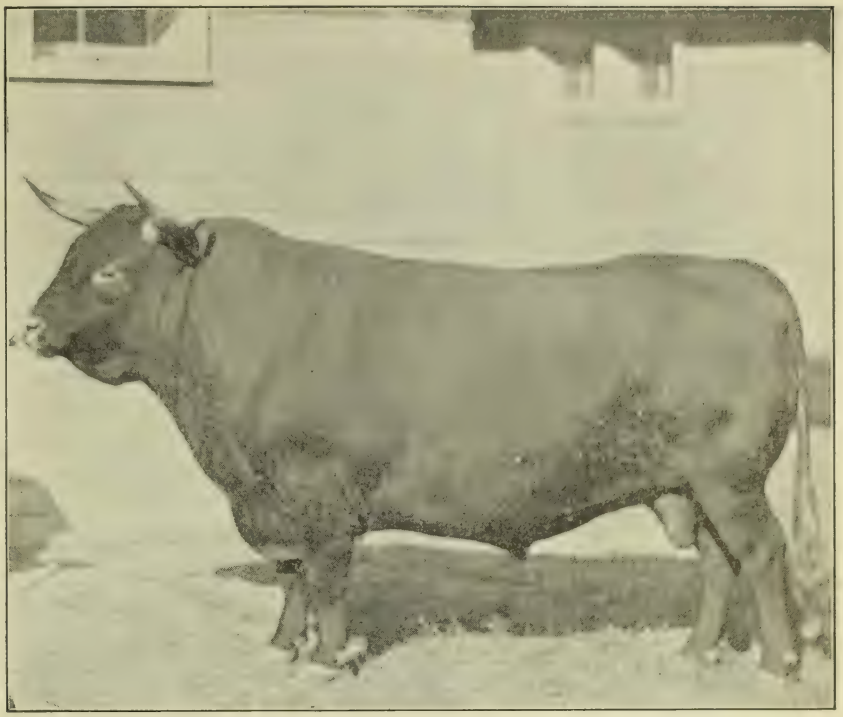


Red Polled Cow, Dorothy, 3973.

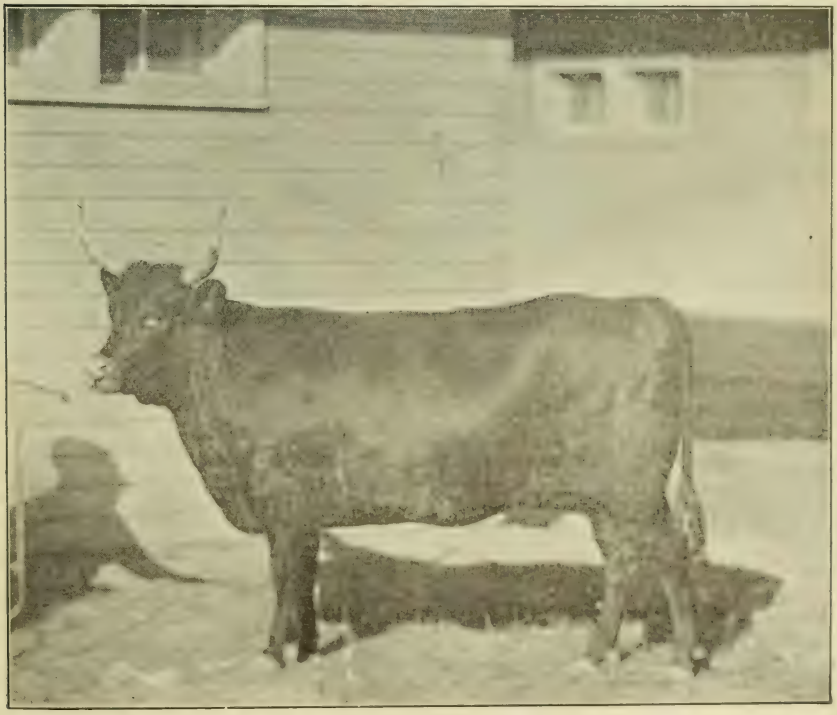
In the cow the udder should be specially well developed, large and circular and the teats of good size and well placed. The udder should be the sponsor for the dairy qualities while the general form and the condition should be indicative of the qalities for beef.

The color a deep rich red, with only the brush of the tail white, and occasionally white on the udder in cows.

Devon.—This breed derives its name from its native district in England.



Devon Bull, Tulips Royal, 5981.



Devon Cow, Lena D, 11,825, at two years old.

Color, a rich deep red throghout, except a turf of long white hair in the brush of the tail, and a white spot on the udder in cows, and about the purse in bulls.

The back is straight, broad, and covered with a thick layer of flesh; the horns rather long and slender; size would be classed as medium. In this breed the beefing and milking qualities are well developed. The steers while not large are quick, easy feeders.

Mississippi Agricultural Experiment Station.

BULLETIN No. 77.

ANALYSES OF COMMERCIAL FERTILIZERS

ON SALE IN THE STATE.

By W. L. Hutchinson, Acting State Chemist.

CHEMICAL LABORATORY.

AGRICULTURAL COLLEGE, MISS.

SEPT. 1, 1902.

MISSISSIPPI STATIONERY CO., YAZOO CITY.

MISSISSIPPI FERTILIZER CONTROL.

INSPECTION AND ANALYSES OF FERTILIZERS.

BY THE CHEMICAL DEPARTMENT OF THE

Mississippi Agricultural & Mechanical College.

*W. F. HAND ..... STATE CHEMIST

J. S. CARROLL ..... ASSISTANT CHEMIST

I. D. SESSUMS ..... ASSISTANT CHEMIST

H. S. CHILTON ..... ASSISTANT CHEMIST

MISS MAUD BUTLER ..... STENOGRAPHER

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*W. L. HUTCHINSON ..... ACTING STATE CHEMIST

ANALYSES OF COMMERCIAL FERTILIZERS

ON SALE IN THE STATE.

Of the several hundred samples of fertilizer collected by the inspector for this department this season from goods sold or offered for sale in this State, 345 were analyzed and the analytical results are reported in this bulletin, while quite a number of brands are offered for sale most of the fertilizer used is represented by a few brands and of these several samples are always analyzed.

The inspection shows that as a rule the goods sold last season were as good or better than they were guaranteed to be. Several samples, however, have a relative value below the guarantee of the manufacturer. In most cases this deficiency is very small but in eight or ten samples it amounts to more than fifty cents a ton. Where more than one sample of a brand is analyzed the average results at least should equal or exceed the guarantee and where only one sample is analyzed it should not show a deficiency of over fifty cents a ton while the safest and best plan is not to have any deficiency at all.

Some few irregularities occurred this season but they were corrected when attention was callled to them. It seems that some manufacturers can't avoid shipping untagged goods or shipping goods in sacks not properly printed or selling brands not on file in the office of the State Chemist. Evidently the same parties should not make these mistakes every year.

In calculating the relative values of the different brands of fertilizers the following schedule of prices was used ; viz :

	Per Pound.
For Nitrogen	16¼ cents
For Potash	5 cents
For Water-Soluble Phosphoric Acid	5½ cents
For Citrate-Soluble Phosphoric Acid	5 cents
For Phosphoric Acid in fine bone	3 cents
For Phosphoric Acid in medium and coarse bone	2½ cents

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	A. D. ADAIR & MCCARTY BROTHERS, Atlanta, Ga.	
2429	Furman's H. G. Dis. Bone	H. S. Massey & Son, Iuka
		Guarantee
2430	Farish Furman Formula	H. S. Massey & Son, Iuka
		Guarantee
	ARMOUR FERTILIZER WORKS Atlanta, Ga.	
2474	Helmet Brand Fert. No. 271	Canton Cotton Warehouse Co. Canton
2524	Helmet Brand Fert. No. 271	L. Pittman & Co., Columbia.
2561	Helmet Brand Fert. No. 271	W. J. Hubbard, Shuqualak.
		Average
		Guarantee
2570	Helmet Brand Fert. No. 285	J. A. Mehaffey, Steenston
		Guarantee
2592	Helmet Brand Fert. No. 282	J. S. Turner & Co., Hattiesburg
		Guarantee
	BIRMINGHAM FERT. CO., Birmingham, Ala.	
2427	Birmingham H.G. Acid Phos	Gilmore & May, Amory
2572	Birmingham H.G. Acid Phos	Myers & Egger, Caledonia
		Average
		Guarantee
2428	Birmingham H. G. Fert.	Gilmore & May, Amory
2571	Birmingham H. G. Fert.	Myers & Egger, Caledonia
		Average
		Guarantee
	Sold by BLUMENFELD & FRIED, Ackerman, Miss.	
2409	B. & F.'s Own Mixture	Blumenfeld & Fried, Ackerman
		Guarantee
	CANTON COTTON WAREHOUSE CO., Canton, Miss.	
2475	Acid Phosphate	Canton Cotton Warehouse Co. Canton
		Guarantee
	CAPITAL FERT. & MFG. CO., Jackson, Miss.	
2381	H. G. Acid Phosphate	Capital Fertilizer & Mf'g Co Jackson
2484	H. G. Acid Phosphate	M. J. L. Hoye's Son, Newton
2651	H. G. Acid Phosphate	McIntyre & Gates, D'Lo
2652	H. G. Acid Phosphate	Max Priebatsch, Brookhaven
		Average
		Guarantee
2354	Nonpariel	Becker, Lyell & McGrath Co., Wesson

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2429	10.82	10.06	3.12	13.18	.67			$14 18
		9.00	*3.00*	*12.00*	*2.00*			*12.90*
2430	10.44	8.43	2.68	11.11	.55		2.17	14.12
		7.00	*3.00*	*10.00*	*2.00*		*2.00*	*12.70*
2474	7.42	3.80	3.08	6.88	10.09	1.70	.97	13.76
2524	4.97	1.93	6.85	8.78	1.66	1.87	1.25	16.30
2561	5.90	3.94	4.82	8.76	8.92	1.63	1.15	15.60
	6.10	**3.22**	**4.92**	**8.14**	**6.89**	**1.73**	**1.12**	**15.22**
		5.00	*2.00*	*7 00*	*1.50*	*1.65*	*1.00*	*13.86*
2570	8.51	5.35	2.34	7.69	1.39	1.47	5.20	18.20
		5.50	*2.50*	*8.00*	*1.50*	*1.65*	*5.00*	*18.91*
2592	7.27	4.09	3.22	7.31	7.72	1.68	1.98	15.16
		5.50	*2.50*	*8.00*	*1.50*	*1.65*	*2.00*	*15.91*
2427	10.96	9.61	3.42	13.03	1.20			13.99
2572	13.24	11.41	4.18	15.59	1.56			16.73
	12.10	**10.51**	**3.80**	**14.31**	**1.38**			**15.36**
		12.00	*2.00*	*14.00*	*2.00*			*15.20*
2428	12.85	8.69	3 56	12.25	1.39	1.73	2.51	21.25
2571	11.97	8.96	4.09	13.05	.67	1.78	3.00	22.73
	12.41	**8.83**	**3.83**	**12.65**	**1.03**	**1.75**	**2.76**	**21.99**
		8.00	*2.00*	*10.00*	*2.00*	*1.64*	*2.00*	*18.13*
2409	12.52	7.55	2.75	10.30	1.10	1.94	2.37	19.73
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*18.16*
2475	11.35	12.87	4.52	17.39	1.91			18.68
		13.00	*2.00*	*15.00*	*1.00*			*16.30*
2381	10.29	12.29	1.92	14.21	.22			15.44
2484	11.99	10.89	2.80	13.69	.47			14.78
2651	10.55	11.19	2.98	14.17	29			15.29
2652	10.73	10.41	2.99	13.40	.51			14.44
	10.89	**11.20**	**2.67**	**13.87**	**.37**			**15.24**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
2354	9.39	8.42	2.90	11.32	.78	1.62	2.01	19.44

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2355	Nonpariel	Wm. Atkinson & Bacot Co., Osyka.
2380	Nonpariel	W. C. Ellis, Magee
2454	Nonpariel	W. A. Daniel, Magnolia
2508	Nonpariel	G. H. Banks, Forest
2602	Nonpariel	Hawkins & Co., Hattiesburg
2604	Nonpariel	Zollie Daniel, Brookhaven
2653	Nonpariel	A. E. Kelly, Kosciusko
2654	Nonpariel	W. H. Gillaspy, Hickory
2655	Nonpariel	M. Snowden, Woodville
2656	Nonpariel	J. E. Cobb & Son, Wiers
2657	Nonpariel	T. B. Gaddis, Morton
2658	Nonpariel	Laurel Mercantile Co., Laurel
2659	Nonpariel	W. J. Davis, Terry
2660	Nonpariel	J. P. Cox & Son, Braxton
2762	Nonpariel	McIntyre & Gates, D'Lo.
2763	Nonpariel	M. J. L. Hoye's Son, Newton
2764	Nonpariel	Holmes Bros., McComb City
2765	Nonpariel	Max Priebatsch, Brookhaven
2766	Nonpariel	W. H. Barron & Co., Crystal Springs
2767	Nonpariel	W. C. Ellis, Florence
2768	Nonpariel	H. A. Brown, Weathersby
2769	Nonpariel	J. L. Moyse & Bro., Summit
2770	Nonpariel	Hyman Mercantile Co., Summit
		Average
		Guarantee
2356	Red Star Brand	S. Alcus, Summit
2451	Red Star Brand	R. T. Scherck, Brookhaven
2603	Red Star Brand	Wm. Atkinson & McDonald, Wesson
2661	Red Star Brand	J. R. Webster & Co., Braxton
		Average
		Guarantee
2452	Mississippi Guano	Max Priebatsch, Brookhaven
2662	Mississippi Guano	Carter & Wilson, French Camp
		Average
		Guarantee
2453	Our Vegetable Grower	McComb City Mer. Co. McComb City
2663	Our Vegetable Grower	Hutchison & Co., Crystal Springs
		Average
		Guarantee
2799	German Kainit	I. M. Eagan, Crystal Springs
		Guarantee
	CONTINENTAL FERT. CO., Nashville, Tenn.	
2568	Eddystone Sol. Guano	J. A. Mehaffey, Steenston
2591	Eddystone Sol. Guano	W. S. Welborn & Bro, Soso
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2355	9.46	7.60	2.97	10.57	.88	1.86	2.55	$19.93
2380	10.61	8.19	2.62	10.81	.51	1.34	2.24	18.22
2454	9.92	8.03	2.93	10.96	.43	1.48	2.09	18.66
2508	10.76	7.00	2.41	9.41	1.00	1.81	2.03	18.02
2602	11.18	7.20	1.99	9.19	.41	1.84	1.98	17.87
2604	10.87	6.96	1.92	8.88	.46	1.80	2.06	17.49
2653	11.06	7.34	2.44	9.78	.78	1.56	2.29	17.87
2654	9.77	7.89	2.76	10.65	.41	1.62	2.30	19.00
2655	11.10	7.39	2.12	9.51	.32	1.69	1.85	17.59
2656	10.80	7.34	2.19	9.43	.37	1.95	2.01	18.61
2657	10.79	7.37	2.85	10.22	.74	1.88	2.25	19.32
2658	10.15	6.73	2.60	9.33	.67	2.03	1.92	18.52
2659	10.71	8.30	2.55	10.85	.09	1.40	2.25	18.48
2660	10.90	7.05	2.22	9.27	.35	1.80	2.07	17.90
2762	10.90	7.89	2.53	10.42	.22	1.45	2.21	18.13
2763	9.45	8.49	2.88	11.37	.36	1.40	2.03	18.80
2764	10.11	6.63	2.41	9.04	.65	1.60	2.62	17.52
2765	10.78	7.39	2.78	10.17	.36	1.75	2.00	18.60
2766	10.26	7.29	2.73	10.02	.38	1.74	2.16	18.56
2767	10.05	7.18	2.91	10.09	.36	1.93	1.77	18.85
2768	10.89	7.10	2.65	9.75	.58	1.38	2.16	17.11
2769	11.21	6.86	2.41	9.27	.38	1.83	1.99	17.89
2770	9.69	6.36	2.48	8.84	.91	1.83	2.11	17.53
	10.45	**7.42**	**2.55**	**9.97**	**.52**	**1.69**	**2.12**	**18.33**
		7.00	*2.00*	*9.00*	*.50*	*1.50*	*2.00*	*16.58*
2356	8.82	7.90	2.74	10.64	.91	1.87	2.41	19.92
2451	9.03	7.55	3.08	10.63	.78	1.77	2.43	19.57
2603	11.69	7.66	1.98	9.64	.37	1.55	1.98	17.42
2661	10.00	7.89	2.93	10.82	.29	1.54	2.36	18.98
	9.89	**7.75**	**2.68**	**10.43**	**.59**	**1.68**	**2.30**	**18.97**
		7.00	*2.00*	*9.00*	*.50*	*1.50*	*2.00*	*16.58*
2452	10.61	7.55	2.13	9.68	.64	1.88	2.22	18.77
2662	10.97	6.97	2.72	9.69	1.13	1.55	1.98	17.41
	10.79	**7.26**	**2.43**	**9.69**	**.89**	**1.72**	**2.10**	**18.09**
		7.00	*2.00*	*9.00*	*.50*	*1.50*	*2.00*	*16.58*
2453	10.00	6.59	2.18	8.77	.32	2.28	4.93	21.77
2663	10.95	6.75	2.29	9.04	.41	2.47	4.40	22.14
	10.47	**6.67**	**2.24**	**8.91**	**.36**	**2.38**	**4.66**	**21.96**
		5.00	*2.00*	*7.00*	*1.00*	*2.50*	*3.50*	*19.13*
2799	2.91						12.36	12.36
							12.00	*12.00*
2568	9.77	7.69	3.07	10.76	.82	1.46	1.24	17.51
2591	9.10	6.93	3.41	10.34	3.22	1.84	1.04	18.05
	9.43	**7.31**	**3.24**	**10.55**	**2.02**	**1.65**	**1.14**	**17.78**
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*1.00*	*16.06*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2569	Sunny South Acid Phos	J. A. Mehaffey, Steenston
2613	Sunny South Acid Phos	W. S. Welborn & Bro., Soso
		Average
		Guarantee
2664	Bear H. G. Dis. Bone	J. F. Shumaker, Rural Hill
		Guarantee
	EAGLE COTTON OIL CO. Meridian, Miss.	
2607	Eagle H. G. Acid Phos	A. Roberts & Co., Lauderdale
		Guarantee
	HAZLEHURST OIL MILL & FERTILIZER CO. Hazlehurst, Miss.	
2470	H. G. Acid Phos	Hazlehurst Oil Mill & Fert. Co., (Hazlehurst) Guarantee
2469	Imperial Fertilizer	J. R. Gillaspy, Crystal Springs
2606	Imperial Fertilizer	Hyman Mer., Co. Summit
		Average
		Guarantee
2797	German Kainit	Hazlehurst Oil Mill & Fert. Co., (Hazlehurst) Guarantee
	JACKSON FERTILIZER CO Jackson, Miss.	
2372	H. G. Acid Phos	Lotterhos & Huber, Crystal Springs
2458	H. G. Acid Phos	I. N. Varnado, Osyka
2506	H. G Acid Phos	T. M. Steele, Forest
2548	H. G. Acid Phos	Buckley Bros., Enterprise
2665	H. G. Acid Phos	Lampton Mer. Co., Magnolia
2666	H. G. Acid Phos	R. F. Everett, Braxton
		Average
		Guarantee
2373	Royal C. Brand	A. C. Seavy, Brookhaven
2374	Royal C. Brand	Holmes Bros., McComb City
2375	Royal C. Brand	Wm Atkinson & McDonald, Wesson
2495	Royal C. Brand	T. M. Heidelberg, Heidelberg
2504	Royal C. Brand	J. M. Stephenson, Morton
2525	Royal C. Brand	The Lampton Co., Columbia
2526	Royal C. Brand	J. P. Myer Mer. Co., Taylorsville
2549	Royal C. Brand	A. B. Williamson & Co., Buckatunna
2550	Royal C. Brand	Buckley Bros., Enterprise
2584	Royal C. Brand	Lampton Mer. Co., Magnolia
2585	Royal C. Brand	C. Atkinson's Son's Co., Summit
2586	Royal C. Brand	Parsons, Moreton, Wentworth Co., Brookhaven
2587	Royal C. Brand	Lotterhos & Huber, Crystal Springs
2588	Royal C. Brand	Lampton & Rawls Co., Mt. Olive
2670	Royal C. Brand	Irving & Torbert, Weirs

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2569	12.57	10.95	3.35	14.30	.13			$15.40
2613	10.47	8.95	3.86	12.81	1.26			13.71
	11.52	**9.95**	**3.61**	**13.56**	**.69**			**14.56**
		11.00	*2.00*	*13.00*	*1.00*			*14.10*
2664	12.30	10.82	2.78	13.60	1.08			14.68
		12.00	*2.00*	*14.00*	*1.00*			*15.20*
2607	11.80	11.12	3.47	14.59	.70			15.70
		11.25	*2.75*	*14.00*	*.75*			*15.13*
2470	13.91	12.77	3.62	16.39	2.89			17.67
		12.00	*2.00*	*14.00*	*2.00*			*15.20*
2469	11.58	8.57	2.56	11.13	1.97	1.65	2.06	19.41
2606	12.11	9.16	2.29	11.45	1.14	1.64	2.10	19.80
	11.84	**8.87**	**2.43**	**11.29**	**1.56**	**1.65**	**2.05**	**19.60**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.50*	*16.56*
2797	4.18						12.60	12.60
							12.00	*12.00*
2372	14.45	12.24	1.65	13.89	1.83			15.11
2458	13.66	13.48	3.24	16.72	1.83			18.07
2506	14.62	12.96	2.69	15.65	1.92			16.95
2548	11.84	11.36	2.92	14.28	2.93			15.42
2665	11.77	10.99	3.48	14.47	2.81			15.57
2666	11.50	10.89	3.74	14.63	2.75			15.72
	12.97	**11.99**	**2.95**	**14.94**	**2.34**			**16.14**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
2373	12.39	8.08	1.91	9.99	1.62	1.78	2.00	18.58
2374	13.78	8.62	1.50	10.12	1.80	1.63	2.00	18.28
2375	13.40	8.39	1.35	9.74	2.13	1.60	2.04	17.82
2495	12.78	8.26	2.70	10.96	3 08	1.65	2 27	19.42
2504	13 31	8.26	2.13	10.39	2.99	1.68	2.13	18.81
2525	12.26	9.04	1.92	10.96	2.56	1.45	1.91	18.49
2526	12.29	9.68	1.69	11.37	1.69	1.40	2.24	19.13
2549	12.74	9.24	2.3	11.57	2.25	1.50	1.96	19.33
2550	12.31	8.35	2.64	10.99	4.04	1.48	1.98	18.62
2584	12.84	8.61	2.27	10.88	1.79	1.73	2.00	19.36
2585	12.97	9.01	1.91	10.92	1.96	1.52	2.02	18.78
2586	12.57	9.24	1.83	11.07	1.92	1.62	1.96	19.22
2587	12.70	9.51	1.57	11.08	1.98	1.61	1.90	19.16
2588	12.35	8.49	1.86	10.35	1.78	1.75	2.04	18.93
2670	11.94	8.79	2.08	10.87	1.78	1.60	2.17	19.12

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2671	Royal C. Brand	Potts-Jackson Co., Kosciusko
2748	Royal C. Brand	J. H. South, Florence
2749	Royal C. Brand	Barney, Johns & Co., Gloster
2750	Royal C. Brand	T. M. Steele, Forest
2751	Royal C. Brand	J. A. Taylor & Son, Pelahatchie
2752	Royal C. Brand	H. A. Busick, Brandon
2753	Royal C. Brand	N. B. Langford, Canton
2754	Royal C. Brand	Johnson, Woodward Co., Mt. Olive
2755	Royal C. Brand	W. L. Weems, Shubuta
2756	Royal C. Brand	Taylor Bros. & Nelson, Magee
		Average
		Guarantee
2371	Gulf States Guano	Potts-Jackson Co., Kosciusko
2505	Gulf States Guano	M. D. Graham & Co., Forest
		Average
		Guarantee
2421	Chicago R. B. Superphos	Potts-Jackson Co.. Kosciusko
2457	Chicago R. B. Superphos	Holmes Bros., McComb City
2667	Chicago R. B. Superphos	Potts-Jackson Co., Kosciusko
2668	Chicago R. B. Superphos	M. D. Graham & Co., Forest
		Average
		Guarantee
2456	Lampton's Am. R. B. S'phos	Lampton Mer. Co., Magnolia
2532	Lampton's Am. R. B. S'phos	The Lampton Co.,Columbia
2669	Lampton's Am. R. B. S'phos	The Lampton Mer. Co., Magnolia
		Average
		Guarantee
2596	L. & H. Special Fertilizer	Lotterhos & Huber, Crystal Springs
		Guarantee
2455	Bone Meal	Holmes Bros., McComb City
		Guarantee
2597	Vegetable & Fruit Fertilizer	Lotterhos & Huber, Crystal Springs
		Guarantee
2801	Kainit	Lampton Mer. Co., Magnolia
		Guarantee
	LAUREL OIL & FERT. CO., Laurel, Miss.	
2542	Laurel H. G. Acid Phos.	S. H. Floyd Mer. Co., Shubuta
2598	Laurel H. G. Acid Phos	Laurel Mer. Co., Laurel
		Average
		Guarantee
2382	Plow Brand	W. T. Day, Mt. Olive
2496	Plow Brand	Abney & Travis, Heidelberg
2527	Plow Brand	J. S. Eaton & Bro., Taylorsville
2599	Plow Brand	Laurel Mer. Co., Laurel
2673	Plow Brand	Hawkins & Co., Hattiesburg
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2671	11.50	8.57	2.19	10.76	1.79	1.88	2.13	19.86
2748	12.73	8.17	2.35	10.52	2.80	1.57	1.95	18.39
2749	11.95	8.85	2.31	11.16	2.47	1.58	2.02	19.20
2750	12.05	8.25	2.40	10.65	2.69	1.60	2.06	18.74
2751	12.88	7.64	2.36	10.00	2.09	1.72	2.02	18.37
2752	11.97	8.66	2.35	11.01	1.79	1.56	2.36	19.31
2753	13.10	8.00	2.01	10.01	2.89	1.51	1.94	17.66
2754	13.21	8.19	2.28	10.47	2.23	1.95	2.30	19.93
2755	12.36	8.11	3.02	11.13	3.67	1.40	1.81	18.30
2756	11.81	8.47	2.45	10.92	2.20	1.78	2.22	19.77
	12.57	**8.58**	**2.14**	**10.72**	**2.32**	**1.62**	**2.06**	**18.90**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*17.41*
2371	12.12	7.43	1.42	8.85	1.38	1.70	2.29	17.41
2505	12.79	8.38	2.60	10.98	2.29	1.72	2.22	19.63
	12.46	**7.91**	**2.01**	**9.92**	**1.84**	**1.71**	**2.26**	**18.52**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*17.41*
2421	12.95	8.23	2.94	11.17	2.88	1.55	1.98	19.01
2457	11.01	7.89	3.50	11.39	3.76	1.85	1.58	19.77
2667	9.10	7.05	4.07	11.12	4.03	1.74	1.89	19.37
2668	11.92	8.26	3.25	11.51	4.03	1.80	2.03	20.22
	11.24	**7.86**	**3.44**	**11.30**	**3.68**	**1.74**	**1.87**	**19.60**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*17.41*
2456	11.52	8.03	3.37	11.40	3.89	1.78	1 63	19.62
2532	12.80	8.01	3.11	11.12	3.58	1.64	1.76	19 01
2669	10.25	7.02	4.19	11.21	3.44	1.77	2.02	19.69
	11.52	**7.68**	**3.58**	**11.26**	**3.64**	**1.73**	**1.80**	**19.46**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*17.41*
2596	11.44	6.98	2.19	9.17	1 42	2.00	3.42	19.79
		6.50	*2.00*	*8.50*	*1.00*	*2.00*	*2.30*	*17.95*
2455	3.94				28.82	2.13		24.21
					25.00	*2.47*		*23.03*
2597	13.04	5.58	1.28	6.86	1.28	2.72	3.83	20.09
		3.00	*3.00*	*6.00*	*1.00*	*3.00*	*4.00*	*20.05*
2801	4.82						12.28	12.28
							12.00	*12.00*
2542	13.15	10.21	2.39	12.60	4.13			13.63
2598	11.85	8.09	5.14	13.23	4.72			14.04
	12.50	**9.15**	**3.77**	**12.97**	**4.42**			**13.84**
		10.00	*2.00*	*12.00*				*13.00*
2382	10.50	7.80	2.04	9.84	.59	2.02	1.92	19.11
2496	9.92	7.11	3 15	10.26	.49	1.84	2.27	19.22
2527	9.91	7.06	2.54	9.60	.70	1.91	2.12	18.63
2599	11.39	6.42	2.86	9.28	2.49	1.88	1.96	17.99
2673	10.07	7.01	2.77	9.78	.61	2.04	2.28	19.39
	10.36	**7.08**	**2.97**	**9.75**	**.98**	**1.94**	**2.11**	**18.87**
		7.00	*2.00*	*9.00*		*1.75*	*1.50*	*16.89*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2672	K. C. Mixture	Laurel Oil & Fert. Co., Laurel
		Guarantee
	Sold by MARBACH & EAGAN Crystal Springs, Miss.	
2370	Bat Guano	I. M. Eagan, Crystal Springs
		Guarantee
	MERIDIAN FERTILIZER FACTORY Meridian, Miss.	
2383	Meridian Southern Ac. Phos	The Gaddis Slay Co., Magee
2420	Meridian Southern Ac. Phos	Seward & Gaston, Ackerman
2426	Meridian Southern Ac. Phos	Phillips, Hinds & Co., Booneville
2431	Meridian Southern Ac. Phos	Matthews & Cotton, Iuka
2485	Meridian Southern Ac. Phos	McLeod & Thornton, Pachuta
2553	Meridian Southern Ac. Phos	C. C. Hand, Enterprise
2601	Meridian Southern Ac. Phos	N. P. Welborn & Co., Laurel
		Average
		Guarantee
2424	Meridian English Acid Phos	A. E. Dalrymple, Amory
		Guarantee
2357	Meridian Home Mixture	John McGrath & Sons, Brookhaven
2384	Meridian Home Mixture	Holloway & McRaney, Collins
2385	Meridian Home Mixture	Story & Smythe, Forest
2432	Meridian Home Mixture	Lann & Carter, Aberdeen
2450	Meridian Home Mixture	T. L. Cotten, Summit
2487	Meridian Home Mixture	McLeod & Kennedy Co., Hattiesburg
2488	Meridian Home Mixture	Laurel Mer. Co., Laurel
2520	Meridian Home Mixture	Waddell & May, Brandon
2528	Meridian Home Mixture	C. A. Cranford, Seminary
2551	Meridian Home Mixture	J. W. McKay, Waynesboro
2552	Meridian Home Mixture	J. K. Kirkland, Quitman
2600	Meridian Home Mixture	T. A. Massey & Co., Soso
2676	Meridian Home Mixture	Cason & Whittington, Gloster
2677	Meridian Home Mixture	T. C. Edwards, Shuqualak
2678	Meridian Home Mixture	W. A. Abrams, Baldwyn
2679	Meridian Home Mixture	G. R. Edwards, McCool
2786	Meridian Home Mixture	G. K. Evans & Co., Pachuta
2787	Meridian Home Mixture	W. B. Richardson, Newton
2788	Meridian Home Mixture	C. C. Hand, Enterprise
2789	Meridian Home Mixture	S. H. Floyd Mer. Co., Shubuta
2790	Meridian Home Mixture	A. E. Dalrymple, Amory
2791	Meridian Home Mixture	Phillips, Hinds & Co., Booneville
2792	Meridian Home Mixture	Matthews & Cotten, Iuka
2793	Meridian Home Mixture	Irving & Torbert, Weirs
2794	Meridian Home Mixture	J. P. Myer, Ellisville
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2672	8.90	7.13	2.91	10.04	.52	2.06	2.08	$19.53
		7.00	*2.00*	*9.00*		*1.75*	*1.50*	*16.89*
2370	13.58				11.91	4.37	.62	20.78
					5.00	*4.25*	*.65*	*16.96*
2383	16.55	11.64	3.51	15.15	1.05			16.31
2420	13.95	11.51	3.61	15.12	1.05			16.27
2426	14 45	11.64	2.78	14.42	.88			15.58
2431	15.31	11.53	3.00	14.53	1.19			15.68
2485	13.95	11.85	2.67	14.52	1.89			15.71
2553	13.96	12.75	3.84	16.59	1.34			17.87
2601	12.26	11.46	4.40	15.86	.45			17.01
	14.35	**11.77**	**3.40**	**15.17**	**1.12**			**16.35**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
2424	15.68	10.98	2.76	13.74	1.38			14.84
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
2357	12.50	7.74	1.79	9.53	1.22	1.87	2.40	18.78
2384	11.95	7.96	2.77	10.73	.79	1.70	2.23	19.28
2385	13.46	7.09	2.19	9.28	.74	1.74	2.22	17.86
2432	11.50	7.24	2.72	9.96	1.13	1.65	2.35	18.40
2450	12.20	7.65	2.61	10.26	.92	1.78	2.29	19.10
2487	13.19	8.06	2.72	10.78	.73	1.82	2.15	19.65
2488	12.37	7.18	2.98	10.16	1.15	1.60	2.21	18.29
2520	11.30	7.57	3.03	10.60	1.04	1.54	2.05	18.42
2528	12.82	7.13	2 94	10.07	.52	2.01	2.19	19.51
2551	10.92	7.46	2.74	10.20	2.81	1.63	2.05	18.29
2552	11.95	7.45	2.65	10.10	1.84	1.65	2.35	18.56
2600	13.02	7.93	2.38	10.31	2.10	1.50	1.79	17.77
2676	11.20	7.93	2.80	10.73	.82	1.87	2.36	19.96
2677	13.16	7.79	2.51	10.30	1.24	1.87	2.67	19.83
2678	12.36	8.02	2.71	10.73	1.07	1.85	2.22	19.77
2679	12.69	7.96	2.40	10.36	1.54	1.60	1.87	18.23
2786	12.72	6.93	2.63	9.56	.87	1.72	2.27	18.11
2787	13.11	7.23	2.66	9.89	.74	1.78	2.09	18.49
2788	13.33	7.29	2.43	9.72	1.09	1.77	2.00	18.20
2789	12.23	7.14	3.04	10.18	.95	1.70	2.20	18.62
2790	12.01	7.70	2.50	10.20	2.57	1.40	2.63	18.15
2791	14.31	7.83	2.26	10.09	1.34	1.75	2.20	18.76
2792	11.90	6.75	2.18	8.93	2.24	1.83	2.49	18.04
2793	12.20	7.62	2.55	10.17	1.77	1.72	2.34	18.86
2794	12 51	7.97	2.64	10.61	.74	1.75	2.32	19.42
	12.44	**7.55**	**2.59**	**10.14**	**1.28**	**1.72**	**2.24**	**18.73**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*18.16*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2425	Meridian Blood and Bone	Mathews & Cotten, Iuka
2448	Meridian Blood and Bone	J. W. Elliott, Magnolia
2486	Meridian Blood and Bone	W. B. Richardson, Newton
2674	Meridian Blood and Bone	A. E. Dalrymple, Amory
2675	Meridian Blood and Bone	Centreville Mer. Co., Centreville
		Average
		Guarantee
2449	Meridian Soluble Guano	J. W. Elliott, Magnolia
		Guarantee
2680	Meridian Vegetable Grower	W. H. Barron & Co., Crystal Springs
		Guarantee
2798	Meridian German Kainit	W. H. Barron & Co., Crystal Springs
		Guarantee
	MOBILE PHOSPHATE CO., Mobile, Ala.	
2386	I. X. L. Acid Phosphate	Winner & Meyer, Meridian
2492	I. X. L. Acid Phosphate	J. P. Myer, Ellisville
2563	I. X. L. Acid Phosphate	T. C. Edwards, Shuqualak
2605	I. X. L. Acid Phosphate	Wm. Atkinson & McDonald, Wesson
2681	I. X. L. Acid Phosphate	G. L. Welsh & Son, Shuqualak
2682	I. X. L. Acid Phosphate	W. W. Harris, Iuka
2683	I. X. L. Acid Phosphate	Seward & Gaston, Ackerman
		Average
		Guarantee
2387	Mobile Standard Guano	Winner & Meyer, Meridian
2491	Mobile Standard Guano	J. P. Myer, Ellisville
2514	Mobile Standard Guano	W. M. Hyde & Co., Poplarville
2529	Mobile Standard Guano	O. W. Conner & Co., Seminary
2557	Mobile Standard Guano	Weatherby & Huggins, Waynesboro
2558	Mobile Standard Guano	F. H. Deas, Enterprise
2559	Mobile Standard Guano	W. V. Thompson, Quitman
2562	Mobile Standard Guano	E. F. Nunn & Co., Shuqualak
2590	Mobile Standard Guano	Wm. Atkinson & McDonald, Wesson
2686	Mobile Standard Guano	J. J. Rogers & Son, Tupelo
2687	Mobile Standard Guano	Grunewald & Lowenberg, McCool
2688	Mobile Standard Guano	W. J. Hubbard, Shuqualak
2771	Mobile Standard Guano	J. L. McLain, State Line
2772	Mobile Standard Guano	Buckley Bros. Enterprise
2773	Mobile Standard Guano	Gilmore & May, Amory
2774	Mobile Standard Guano	Baldwyn Supply Co., Baldwyn
2775	Mobile Standard Guano	W. W. Harris, Iuka
2776	Mobile Standard Guano	A. Roberts & Co., Lauderdale
		Average
		Guarantee
2515	Mobile Double Eagle	W. R. Taylor & Co., Brandon
2555	Mobile Double Eagle	J. L. McLain, State Line
2556	Mobile Double Eagle	G. S. Weems, Shubuta

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2425	14.41	8.88	1.68	10.56	1.59	1.54	1.94	$18.40
2448	14.95	7.94	1.94	9.88	1.56	1.90	1.75	18.60
2486	13.86	8.03	2.21	10.24	.96	1 80	2.30	19.19
2674	13.30	7.83	1 88	9.71	2.57	1.69	2.21	18.20
2675	11.51	8.20	2.83	11.03	1 29	1.64	2.18	19.36
	13.61	**8.18**	**2.11**	**10.29**	**1.59**	**1.71**	**2.08**	**18.75**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*18.16*
2449	12.20	7.32	2.60	9.92	1.27	1.75	2.29	18.63
		8.00	*2.00*	*10 00*	*1.00*	*1.65*	*2.00*	*18.16*
2680	10.66	6.41	2.38	8.79	1.09	2.36	3.95	21.05
		5.00	*1.00*	*6.00*	*1.00*	*2 50*	*6.00*	*20.63*
2798	3.51						12.08	12.08
							12.00	*12.00*
2386	15.32	12.15	2.44	14.59	2.72			15.81
2492	14.63	10.35	2.50	12.85	4.27			13.89
2563	13.41	10.58	3.82	14.40	1.09			15.46
2605	14.31	11.26	3.23	14.49	1.27			15.62
2681	13.04	9.42	5.01	14.43	1.29			15.37
2682	13 60	10.18	3.49	13.67	1.19			14.69
2683	11.33	9.42	5.15	14.57	1.60			15.51
	13.07	**10.48**	**3.66**	**14.14**	**1.34**			**15.19**
		10.00	*2.00*	*12.00*	*1 00*			*13.00*
2387	12.08	8.75	1.73	10.48	1.02	1.81	2.35	19.59
2491	11.71	4.61	3.34	7.95	7.56	1.70	2.02	15.96
2514	11.71	6.42	2.55	8.97	4.61	1.53	2.15	16.74
2529	11.95	7.05	3.44	10.49	2 72	1.50	1.85	17 92
2557	12.06	5.45	3.02	8.47	4.00	1.70	2.18	16.72
2558	12.25	5.74	3.43	9.17	7.56	1 50	2.03	16.65
2559	10.43	5.03	3.52	8.55	7.47	1.96	1.91	17.33
2562	11.30	4.48	3.85	8.33	7.38	1.68	2.02	16.26
2590	11.09	6.78	2.55	9.33	3.67	1.67	2.24	17.68
2686	10.52	6.05	2.74	8.79	3.53	1.73	2.23	17 25
2687	10.08	6.60	2.45	9.05	3.68	1 85	2.25	17.97
2688	10.17	5.12	3.67	8.79	7.04	1.66	2.08	16.78
2771	10.72	5.23	2.96	8.19	4.02	1.70	2.24	16.48
2772	9.63	4.77	4.43	9.20	6.55	1.83	1.88	17.51
2773	10.64	6.22	2.98	9.20	3.63	1 65	2.24	17.43
2774	9.00	5.02	2 60	7.62	4.18	1 88	2.18	16.41
2775	9.64	5.22	2.81	8.03	4 09	1.83	2.20	16.70
2776	10.84	5.86	2.84	8.70	3.71	1.82	2.10	17.30
	10.88	**5.80**	**3.05**	**8.85**	**4.69**	**1.72**	**2.06**	**17.14**
		6.00	*2.00*	*8.00*	*1.50*	*1.65*	*2.00*	*15.96*
2515	11.59	8.34	2.87	11.21	1.74	1.68	2.39	19 89
2555	12.49	9.04	3.56	12.60	.81	1.65	2.39	21.26
2556	11.86	8.74	3.44	12.18	1.14	1.75	2.45	21.19

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2684	Mobile Double Eagle	Dr. C. C. Ewing, Aberdeen
2685	Mobile Double Eagle	J. L. Moyse & Bro., Summit
		Average
		Guarantee
2554	Eclipse Soluble Guano	R. W. Fagan & Co., Waynesboro
		Guarantee
2795	Genuine German Kainit	Winner & Meyer, Meridian
		Guarantee
	NEW ORLEANS ACID AND FERTILIZER CO., New Orleans, La.	
2360	Black Diamond Acid Phos	S. Cohn & Son, Magnolia
2434	Black Diamond Acid Phos	R. W. Carter, Iuka
2513	Black Diamond Acid Phos	J. & B. McClenahan, Pelahatchie
2689	Black Diamond Acid Phos	Sones & Dansby, Forest
2690	Black Diamond Acid Phos	J. A. Mehaffey, Columbus
		Average
		Guarantee
2359	Crescent City Acid Phos	Louis Cohn & Bros., Brookhaven
2691	Crescent City Acid Phos	Abney & Travis, Heidelburg
		Average
		Guarantee
2364	Goldsmith's Imp. Mixture	S. Cohn & Son, Magnolia
2376	Goldsmith's Imp. Mixture	W. E. Payne, Collins
2377	Goldsmith's Imp. Mixture	W. B. Richardson, Newton
2417	Goldsmith's Imp. Mixture	Seward & Gaston, Ackerman
2443	Goldsmith's Imp. Mixture	Hyman Mer. Co., Summit
2481	Goldsmith's Imp. Mixture	E. E. Bonner, Sandersville
2482	Goldsmith's Imp. Mixture	Eureka Lumber Co., Eastabutchie
2512	Goldsmith's Imp. Mixture	Howie Bros., Morton
2530	Goldsmith's Imp. Mixture	J. M. Graham Seminary
2695	Goldsmith's Imp. Mixture	J. C. Harvey, Gallman
2696	Goldsmith's Imp. Mixture	J. H. South, Florence
2697	Goldsmith's Imp. Mixture	M. H. Clayton, Heidelberg
2698	Goldsmith's Imp. Mixture	J. & B. McClenahan, Pelahatchie
2699	Goldsmith's Imp. Mixture	J P. Myer, Ellisville
2777	Goldsmith's Imp. Mixture	D. H. Jones, Terry
2778	Goldsmith's Imp. Mixture	Sones & Dansby, Forest
2779	Goldsmith's Imp. Mixture	R. W. Hinton Co., Lumberton
2780	Goldsmith's Imp. Mixture	J. P. Myer Mer, Co., Taylorsville
2781	Goldsmith's Imp. Mixture	J. A. Mahaffey, Columbus
2782	Goldsmith's Imp. Mixture	McComb City Mer. Co., McComb City
2783	Goldsmith's Imp. Mixture	Hawkins & Co., Hattiesburg
		Average
		Guarantee
2361	Gold Dust	Wm. Atkinson & Bacot Co , Osyka
2378	Gold Dust	J. S. Eaton & Bro., Taylorsville

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2684	10.91	8.47	4.29	12.76	.86	1.58	2.25	$20.99
2685	10.70	9.01	4.42	13.43	.67	1.74	2.32	22 31
	11.51	**8.72**	**3.72**	**12.44**	**1.04**	**1.68**	**2.36**	**21.13**
		7.50	*2.50*	*10.00*	*1.50*	*1.65*	*2.00*	*18.11*
2554	10.96	7.66	3.34	11.00	2.30	1.61	1.32	18.32
		7.00	*2.00*	*9.00*	*1.50*	*1.65*	*2.00*	*17.06*
2795	4.33						12.10	12.10
							12.00	*12.00*
2360	13.70	11.78	2.66	14.44	3.93			15.62
2434	14.49	10.46	2.41	12.87	3.48			13.92
2513	14.44	9.58	2.84	12.42	3.91			13.38
2689	13.55	7.73	4.47	12.20	3.68			12.97
2690	12.29	8.46	5.24	13.70	3.30			14.55
	13.69	**9.60**	**3.53**	**13.13**	**3.66**			**14.09**
		10.00	*2.00*	*12.00*	*2.00*			*13.00*
2359	9.44	15.00	2.69	17.69	2.76			19.19
2691	12.10	6.58	6.27	12.85	3 89			13.51
	10.77	**10.79**	**4.48**	**15.27**	**3.32**			**16.35**
		10.00	*2.00*	*12.00*	*2.00*			*13.00*
2364	11.65	7.46	2.63	10.09	3.17	1.65	1.29	17 49
2376	13.59	8.37	2.29	10.66	2.70	1.65	1.62	18.48
2377	11.53	7 69	2.30	9.99	2.74	1.83	1.50	18.21
2417	12.50	8.46	2.91	11.37	2.53	1.47	1.67	18.66
2443	13.37	7.82	1.87	9.69	2.90	1.62	1.23	16.97
2481	14.09	8.10	2.25	10.35	3.25	1.45	1.57	17.44
2482	13.76	8.29	1.81	10.10	2.97	1.83	1.51	18.39
2512	14.12	8.20	1.92	10.12	3.61	1.38	1.58	17.01
2530	13.15	8.02	2.52	10.54	3.48	1.62	1.42	18.03
2695	10.88	7.06	2.57	9.63	3.26	1.81	1.81	18.03
2696	12.76	7.59	2.27	9.86	3.28	1.72	2.01	18.22
2697	12.46	7.59	2.82	10.41	3.34	1.53	2.04	18.18
2698	11.32	7.33	2.91	10.24	3.42	1.45	1.69	17.38
2699	11.77	7.07	3.52	10.59	3.21	1.75	1.35	18.34
2777	10.70	7.30	2.64	9.94	3.79	1.79	1.17	17.66
2778	11.66	7.48	2.72	10.20	3.12	1.68	1.43	17.84
2779	12.04	7.06	2.90	9.96	3.12	1.66	1.35	17.41
2780	11.15	6.98	2.70	9.68	3.94	1.58	1.73	17 24
2781	12.74	7.27	2.53	9 80	3.12	1.62	1.58	17.37
2782	12.55	7.38	3.00	10.38	2.71	1.99	1.77	19.36
2783	12.69	8.01	2.25	10.26	3.35	1.60	1.97	18.23
	12.40	**7.64**	**2.54**	**10.18**	**3.19**	**1.65**	**1.59**	**17.90**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
2361	11.66	7.11	2.92	10.03	2.80	1.96	1.72	18.83
2378	11.34	8.14	2.33	10.47	2.30	1.92	1.56	19.08

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2480	Gold Dust	Rew & McClinton, Newton
2543	Gold Dust	G. S. Weems, Shubuta
2608	Gold Dust	McLeod, Kennedy Co., Hattiesb'g
2693	Gold Dust	R. W. Carter, Iuka
2694	Gold Dust	M. H. Rothchild, Woodville
		Average
		Guarantee
2363	Blood, Bone and Beef	J. L. Moyse & Bro., Summit
2700	Blood, Bone and Beef	Moody & Smith, Poplarville
		Average
		Guarantee
2442	Blood, Bone and Potash	Louis Cohn & Bros., Brookhaven
2511	Blood, Bone and Potash	R W. Hinton Co., Lumberton
2531	Blood, Bone and Potash	W. E. Payne, Collins
		Average
		Guarantee
2362	Economiz'r for Cotton & Corn	Louis Cohn & Bros. Brookhaven
2483	Economiz'r for Cotton & Corn	M. J. L. Hoye's Son. Newton
		Average
		Guarantee
2692	Crescent City Bone Meal	McComb City Mer. Co., McComb City
		Guarantee
2796	Pure German Kainit	J. L. Moyse & Bro., Summit
		Guarantee
	STANDARD GUANO AND CHEMICAL M'F'G CO., New Orleans, La.	
2366	Stern's Acid Phosphate	Hyman Mer. Co., Summit
2510	Stern's Acid Phosphate	Howard & Majors, Morton
		Average
		Guarantee
2367	Stern's Am. R. B. Superphos.	C. Atkinson's Sons Co., Summit
2368	Stern's Am. R. B. Superphos.	Parson, Moreton, Wentworth Co., (Brookhaven)
2369	Stern's Am. R. B. Superphos.	I. M. Eagan, Crystal Springs
2447	Stern's Am. R. B. Superphos.	McComb City Mer. Co., McComb City
2489	Stern's Am. R. B. Superphos.	G. K. Evans & Co., Pachuta
2490	Stern's Am. R. B. Superphos.	Johnson-Hand Co., Ellisville
2533	Stern's Am. R. B. Superphos.	W. A. Carraway, Purvis
2564	Stern's Am. R. B. Superphos.	G. L. Welch & Son., Shuqualak
2593	Stern's Am. R. B. Superphos.	J. S. Turner & Co. Hattiesburg
2731	Stern's Am. R. B. Superphos.	F. M. Brooks, Weathersby
2732	Stern's Am. R. B. Superphos.	Howard & Majors, Morton
2734	Stern's Am. R. B. Superphos.	I. N. Varnado, Osyka
2735	Stern's Am. R. B. Superphos.	Holloway & McRaney, Collins
2736	Stern's Am. R. B. Superphos.	Lampton Mer. Co., Magnolia
2737	Stern's Am. R. B. Superphos.	R. T. Scherck, Brookhaven

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2480	14.38	7.93	2.11	10.04	4.06	1.30	1.63	$16.69
2543	13.30	8.32	1.87	10.19	3.59	1.73	1.56	18.21
2608	11.20	7.52	2.93	10.45	2.61	1.87	1.57	18.85
2693	11.55	7.22	3.22	10.44	2.70	1.64	1.56	18.05
2694	12.31	7.47	2.93	10.40	3.20	1.50	1.86	17.88
	12.25	**7.67**	**2.62**	**10.29**	**3.03**	**1.70**	**1.64**	**18.23**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
2363	8.23	8.09	2.85	10.94	6.56	1.65	1.19	18.30
2700	8.70	5.95	2.45	8.40	6.05	1.68	1.47	15.93
	8.46	**7.02**	**2.65**	**9.67**	**6.30**	**1.67**	**1.33**	**17.12**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
2442	11.83	6.60	2.59	9.19	4.61	1.66	1.80	17.05
2511	11.44	6.22	2.24	8.46	5.85	1 50	1.24	15.20
2531	11.91	6.42	2.83	9.25	5.33	1.39	1.17	15.58
	11.73	**6.42**	**2.55**	**8.97**	**5.26**	**1.52**	**1.40**	**15.94**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
2362	11.22	7.85	2.54	10.39	2.66	1.85	2.29	19.48
2483	12.51	7.20	2.73	9.93	2.16	2.14	2.65	20.26
	11.86	**7.52**	**2.64**	**10.16**	**2.41**	**2.00**	**2.47**	**19.87**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*18.16*
2692	5.20				23.61	2.84		23.40
					18.00	*2.50*		*18.93*
2796	2.69						12.22	12.22
							12.00	*12.00*
2366	12.89	11.17	4.99	16.16	2.49			17.28
2510	14.06	11.99	3.95	15.94	2.35			17.14
	13.47	**11.58**	**4.47**	**16.05**	**2.42**			**17.21**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
2367	12.08	8.21	2.88	11.09	2.07	1.60	1.55	18.66
2368	13.12	6.06	4.34	10.40	3.13	1.70	1.51	18.04
2369	12.79	7.51	2.46	9.97	1.86	1.65	1.59	17.67
2447	12.94	8.15	3.57	11.72	1.69	1.53	1.40	18.91
2489	13.08	5.51	4.47	9.98	3.40	1.72	1.56	17.68
2490	14.31	5.56	4.74	10.30	3 38	1.68	1 64	17.96
2533	12.95	8.60	2.16	10.76	3.19	1.61	1.51	18.36
2564	13.96	6.05	4.13	10.18	2.58	1.79	1.72	18.32
2593	15.00	6.12	3.93	10.05	3.31	1.65	1.63	17.66
2731	12.59	5.41	4.64	10.05	3.25	1.82	1.62	18.13
2732	13.14	5.69	4.35	10.04	2.88	1.75	1.62	17.92
2734	12.18	7.27	2.64	9.91	1.36	1.66	1.77	17.80
2735	12.61	7.43	2 62	10 05	1.41	1.63	1.69	17.78
2736	11.77	5.26	6.96	12.22	1.85	1.64	1.52	19.60
2737	11.96	6.54	3.67	10.21	2.93	1.68	1.68	18.00

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2738	Stern's Am. R. B. Superphos.	Hyman Mer. Co., Summit
2739	Stern's Am. R B. Superphos.	Simpson Mer. Co., Terry
2740	Stern's Am. R. B. Superphos.	Taylor Bros. & Nelson, Magee
2741	Stern's Am. R. B. Superphos.	J. A. Spann & Co., Pelahatchie
2742	Stern's Am. R. B. Superphos.	N. B. Langford, Canton
2743	Stern's Am. R. B. Superphos.	W. W. Pigford, Lumberton
2744	Stern's Am. R. B. Superphos.	Wilkinson & Rawls, Poplarville
2745	Stern's Am. R. B. Superphos.	R. Watts & Co., Seminary
2746	Stern's Am. R. B. Superphos.	J. P. Myer Mer. Co., Taylorsville
2747	Stern's Am. R. B. Superphos.	Johnson & Woodward Co., Mt. Olive
		Average
		Guarantee
2379	Mississippi Home Guano	I H. Brown, Hickory
2446	Mississippi Home Guano	Fernwood Lumber Co., Fernwood
2507	Mississippi Home Guano	Gayden & Co., Brandon
2535	Mississippi Home Guano	L. Pittman & Co., Columbia
2536	Mississippi Home Guano	Johnson-Woodward Co., Mt. Olive
2595	Mississippi Home Guano	L. C. Smith, Lauderdale
		Average
		Guarantee
2509	Blood, Bone and Meat	N. B. Langford, Canton
		Guarantee
2445	Pelican R. B. Guano	Wm. Atkinson & Bacot Co., Osyka
2534	Pelican R. B. Guano	Wm. Atkinson & Son, Columbia
		Average
		Guarantee
2594	Standard Am. Sol. Guano	Dunn Bros. Summit
		Guarantee
2444	Champion Farmer's Choice	Max Priebatsch, Brookhaven
		Guarantee
2365	Ground Bone	I. N. Varnado, Osyka
		Guarantee
2802	Kainit	C. Atkinson's Sons Co., Summit
		Guarantee
	SWIFT'S FERTILIZER WORKS, Atlanta, Ga.	
2518	Swift's Chattahoochee Acid Phosphate	Howie Bros., Morton
		Guarantee
2620	Swift's Plantation Phosphate and Potash	Lann & Carter H'd'w Co., Aberdeen
		Guarantee
2498	Swift's Plow Boy Am. Bone and Potash	Viverett & Dear, Newton
2519	Swift's Plow Boy Am. Bone and Potash	Howie Bros., Morton
2547	Swift's Plow Boy Am. Bone and Potash	W. S. Weems, Shubuta

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2738	12.30	5.65	5.18	10.83	2.97	1.66	1.56	18.35
2739	12.49	6.59	4.00	10.59	2.71	1.62	1.66	18.17
2740	12.72	6.83	3 71	10.54	2.64	1.61	1.69	18.15
2741	12.51	5.88	4.57	10.45	3.31	1.67	1.55	18.02
2742	12.77	5.81	4.86	10.67	3.07	1.72	1.61	18.45
2743	12.88	5.82	4.65	10.47	3.36	1.68	1.62	18.13
2744	13.63	6.24	3.71	9.95	2.66	1.75	1.70	17.96
2745	12.75	6.41	3.92	10.33	3.48	1.56	1.70	17.74
2746	13.86	5.40	4.12	10 52	3.07	1.60	1.52	17.88
2747	12.39	5.18	4.83	10.01	3.28	1.85	1.60	18.14
	12.91	**6.41**	**4.04**	**10.45**	**2.79**	**1.67**	**1.61**	**18.13**
		4.00	*5.00*	*9.00*	*1.00*	*1.65*	*1.50*	*16.26*
2379	12.52	6.75	2.39	9.14	2.84	1.98	2.55	18.80
2446	11 22	6.32	2.29	8.61	2.99	2.10	2.74	18.81
2507	11.79	7.22	2.85	10.07	3.81	1.55	1.76	17.59
2535	10.34	7.02	3.04	10.06	4.13	1.72	2.24	18.59
2536	10.30	6.69	2.99	9.68	3.91	1.84	2.59	18.92
2595	10.73	6.38	2.17	8.55	2.23	1.93	3.29	18.75
	11.15	**6.73**	**2.62**	**9.35**	**3.48**	**1.85**	**2.53**	**18.57**
		5.00	*5.00*	*10.00*	*1.00*	*1.65*	*2.00*	*17.86*
2509	12.09	6.00	3.02	9.02	3.25	1.76	2.09	17.43
		4.00	*4.25*	*8.25*	*1.00*	*1.70*	*2.00*	*16 18*
2445	14.40	6.41	4.19	10.60	2.65	1.65	1.54	18.14
2534	13.11	5.42	5.13	10.55	3.30	1.65	1.64	18.10
	13.75	**5.92**	**4.66**	**10.58**	**2.97**	**1.65**	**1.59**	**18.12**
		4.00	*4.00*	*8.00*	*1.00*	*1.65*	*1.50*	*15.26*
2594	13.82	6.24	3.84	10.08	3.91	1.72	1.52	17.81
		4.00	*4.00*	*8.00*	*1.00*	*1.65*	*1.50*	*15.26*
2444	9.70	5.13	2.74	7.87	5.33	1.96	2.00	16.75
		4.00	*4.00*	*8.00*	*1.00*	*1.65*	*1.50*	*15.26*
2365	7.25				21.10	3.60		22.25
					18.50	*2.50*		*17.38*
2802	2.69						12.28	12.28
							12.00	*12.00*
2518	9.54	7.75	3.58	11.33	2.39			12.11
		9.00	*3.00*	*12.00*	*1.00*			*12.90*
2620	8.05	5.12	4.68	9.80	1.01		4.02	14.33
		6.00	*2.00*	*8.00*	*1.00*		*4.00*	*12.60*
2498	8.77	7.46	2.92	10.38	1.46	1.06	1.12	15.69
2519	8.13	5.58	3.40	8.98	1.61	.94	1.40	13.99
2547	8.38	7.10	3.78	10.88	1.66	.97	1.19	15.93

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2619	Swift's Plow Boy Am. Bone and Potash	Wetherbee & Huggins, Waynesboro
		Average
		Guarantee
2497	Swift's Golden Harv't Guano	M. D. Graham & Co., Forest
2702	Swift's Golden Harv't Guano	N. B. Gilliland & Co., Kosciusko
		Average
		Guarantee
2701	Swift's Special H. G. Guano	Lann & Carter H'd'w Co., Aberdeen
		Guarantee
2609	Swift's Yazoo L. G. Guano	Dunn Bros., Summit
		Guarantee
2546	Swift's Mon. H. G. Veg. Gu.	Wetherbee & Huggins, Waynesboro
		Guarantee
	TENNESSEE CHEMICAL CO., Nashville, Tenn.	
2516	Ox Acid Phosphate	Moore Bros., Morton
2703	Ox Acid Phosphate	S. L. Sanders, Corinth
2704	Ox Acid Phosphate	Alexander & Collier, Kosciusko
		Average
		Guarantee
2537	Ox H. G. Dis. Bone	H. B. Lewis, Columbia
2614	Ox H. G. Dis. Bone	T. L. Cotten, Summit
		Average
		Guarantee
2517	Ox Cotton Guano	Moore Bros. Morton
2538	Ox Cotton Guano	Ainsworth-Mayfield Co., Taylorsville
2541	Ox Cotton Guano	G. S. Jackson, Belmont
2705	Ox Cotton Guano	Myers & Egger, Steenston
2706	Ox Cotton Guano	S. L. Sanders, Corinth
		Average
		Guarantee
2573	Ox Slaughter House Bone	Myers & Egger, Caledonia
2615	Ox Slaughter House Bone	Bourdeaux & Co., Lauderdale
		Average
		Guarantee
2544	Ox H. G. Am. Bone	J. H. DuBose, Buckatunna
2545	Ox H. G. Am. Bone	A. M. Cross, Enterprise
		Average
		Guarantee
2621	Ox Potash Mixture	S. L. Sanders, Corinth
		Guarantee
2622	Ox Potash Special	Alexander & Collier, Kosciusko
		Guarantee
	TENNESSEE VALLEY FERTILIZER CO. Florence, Ala.	
2623	King Cotton Grower	J. J. Rogers & Son, Tupelo

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2619	9.27	6.91	3.77	10.68	1.60	1.02	1.37	$16.06
	8.64	**6.76**	**3.47**	**10.23**	**1.58**	**1.00**	**1.27**	**15.42**
		7.00	*3.00*	*10 00*	*2.00*	*.82*	*1.00*	*14.37*
2497	8.25	5.37	2.72	8.09	1.41	1.78	2.11	16.52
2702	7.39	6.17	2.39	8 56	1.64	1.84	2.48	17.64
	7.82	**5.77**	**2.56**	**8.33**	**1.52**	**1.81**	**2.29**	**17.08**
		6 00	*2.00*	*8.00*	*2.00*	*1.65*	*2.00*	*15.96*
2701	7.58	7.50	3.35	10.85	2.01	3.26	2.86	25.05
		7.50	*2.00*	*9.50*	*2.00*	*4.12*	*3.00*	*26.64*
2609	7.50	5.31	3.96	9.27	1.11	1.52	1.07	15.81
		5.00	*2.00*	*7.00*	*2.00*	*1.65*	*1.00*	*13.86*
2546	8.12	6.20	3.08	9.28	1.52	3.25	4 07	24.53
		6.00	*2.00*	*8.00*	*2.00*	*3.29*	*4.00*	*23.29*
2516	10.53	9.49	2.50	11.99	.87			12.94
2703	9.46	7.60	4.83	12.43	1.50			13.19
2704	9.41	6.75	6.12	12.87	4.96			13.55
	9.80	**7.95**	**4.48**	**12.43**	**2.44**			**13.23**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
2537	10.41	11.53	2.86	14.39	.75			15.54
2614	9.72	10.72	3.60	14.32	1.15			15.39
	10.06	**11.13**	**3.23**	**14.36**	**.95**			**15.47**
		12.00	*2.00*	*14 00*	*1.00*			*15.20*
2517	9.46	8.24	2.59	10.83	1.37	1.70	1.00	18.18
2538	9.21	7.64	3.30	10.94	1.22	1.62	1.26	18.23
2541	6.84	7.41	4.18	11.59	1.47	1.47	1.36	18.47
2705	8.74	7.50	3.59	11.09	1.45	1.79	1.28	18.94
2706	8.58	8.20	3.46	11.66	.88	1.50	1 42	18.78
	8.57	**7.80**	**3.42**	**11.22**	**1.28**	**1.62**	**1.26**	**18.52**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*1.00*	*17.16*
2573	9.00	6.77	2.96	9.73	.67	1.66	2.10	17.90
2615	8.50	7 48	2.93	10.41	4.39	1.60	2.02	18.38
	8.75	**7.13**	**2.94**	**10.07**	**2.53**	**1.63**	**2.06**	**18.14**
		6.00	*2 00*	*8.00*	*1.00*	*1.65*	*2.00*	*15.96*
2544	10.15	8.66	2.44	11.10	1.19	1.43	2 15	18.76
2545	9.52	7.57	2.93	10.50	1.09	1.70	2.34	19.12
	9.83	**8.12**	**2.68**	**10.80**	**1.14**	**1.56**	**2.25**	**18.94**
		8.00	*2.00*	*10.00*	*1.00*	*1 65*	*2.00*	*18.16*
2621	8.52	4.48	5 87	10.35	.56		1.97	12.77
		8.00	*2.00*	*10.00*	*1.00*		*2.00*	*12.80*
2622	9.26	6.49	4.34	10.83	1.47		3.89	15.37
		8.00	*2.00*	*10.00*	*1.00*		*4.00*	*14.80*
2623	10.37	6.82	3.32	10.14	5.75	1.15	1.04	15.60

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2707	King Cotton Grower	W. L. Bourland, Amory
		Average
		Guarantee
	Sold by THREEFOOT BROS. & CO., Meridian, Miss.	
2389	Threefoot's H. G. Eng. Acid Phosphate	Threefoot Bros. & Co., Meridian
2708	Threefoot's H. G. Eng. Acid Phosphate	Threefoot Bros. & Co., Meridian
		Average
		Guarantee
2388	Prolific Acid Phosphate	Threefoot Bros. & Co., Meridian
2521	Prolific Acid Phosphate	M D. Graham & Co., Forest
2725	Prolific Acid Phosphate	C. T. Carmichael, DeSoto
		Average
		Guarantee
2390	Threefoot's Imp. Mixture	Threefoot Bros. & Co., Meridian
2499	Threefoot's Imp. Mixture	M. D. Graham & Co , Forest
2565	Threefoot's Imp. Mixture	J. W. McArthur, Preston
2709	Threefoot's Imp. Mixture	Threefoot Bros. & Co., Meridian
		Average
		Guarantee
	VIRGINIA-CAROLINA CHEMICAL CO. Memphis, Tenn.	
2433	Scott's H. G. Acid Phos	Lann & Carter H'd'w Co., Aberdeen
		Guarantee
2423	Royal Acid Phos	Lann & Carter H'd'w Co., Aberdeen
2625	Royal Acid Phos	Dr. S. D Stennis, Mt. Nebo
2710	Royal Acid Phos	J. E. Byrd, Mt. Olive
2711	Royal Acid Phos	L. L. Anderson, Shuqualak
2712	Royal Acid Phos	Sisson & Drane, McCool
		Average
		Guarantee
2713	Royal Dissolved Bone	J. E. Cobb & Son, Wiers
		Guarantee
2358	Scott's Gossypium Phospho.	E. L. Scott, Summit
2393	Scott's Gossypium Phospho.	Donald Bros., Magee
2494	Scott's Gossypium Phospho.	T. M. Heidelburg, Heidelburg
2715	Scott's Gossypium Phospho.	W. C. Wilkinson, Crystal Springs
2716	Scott's Gossypium Phospho.	Lann & Carter H'd'w Co., Aberdeen
2717	Scott's Gossypium Phospho.	W. L. Bourland, Amory
2718	Scott's Gossypium Phospho.	R. J. Shannon, Ripley
2719	Scott's Gossypium Phospho.	Seward & Fancher, McCool
2784	Scott's Gossypium Phospho.	J. L. Bufkin & Son, Vossburg

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2707	10 07	5.49	4.50	9.99	5.26	1.13	1.36	$15.57
	10.22	**6.16**	**3.91**	**10.07**	**5.50**	**1.14**	**1.20**	**15.59**
		8.00	*2.00*	*10.00*	*2.15*	*.82*	*1.00*	*14.47*
2389	13 88	14.07	1.96	16.03	.92			17.44
2708	14.00	13.29	3.14	16.43	.86			17.76
	13.94	**13.68**	**2.55**	**16.23**	**.89**			**17.60**
		13.00	*2.00*	*15.00*	*2.00*			*16.30*
2388	11.77	11 95	2.32	14.27	.74			15.47
2521	11.80	10.95	4.13	15.08	.70			16.18
2725	5.57	9.41	5.71	15.12	1.88			16.06
	9.71	**10.77**	**4.05**	**14.82**	**1.11**			**15.90**
		11.00	*2.00*	*13.00*	*2.00*			*14.10*
2390	12.35	7.75	2.26	10.01	.92	1.73	2.42	18.83
2499	12.57	7.84	2.63	10.47	.87	1.55	1.95	18.24
2565	13.02	7.10	2.58	9.68	2.26	1.65	2.37	18.12
2709	12.92	8.16	1.93	10.09	1.19	1.81	2.17	18.96
	12.71	**7.71**	**2.35**	**10.06**	**1.31**	**1.69**	**2.23**	**18.54**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*18.16*
2433	12.35	9.75	4.83	14.58	2.26			15.56
		12.00	*2.00*	*14.00*	*2.00*			*15.20*
2423	11.00	4.71	8.33	13.04	2.39			13.51
2625	5.45	4.37	10.06	14.43	2.83			14.87
2710	13.98	12.96	4.04	17 00	.40			18.30
2711	12.91	13.79	2.23	16.02	.36			17. 0
2712	6.09	1.18	10.64	11.82	4.48			11.94
	9.89	**7.40**	**7.06**	**14.46**	**2.09**			**15.20**
		10.00	*2.00*	*12.00*	*2.00*			*13.00*
2713	13.63	11.22	5.01	16.23	1.30			17.35
		12.00	*2.00*	*14.00*	*2.00*			*15.20*
2358	10 88	10.39	1.93	12.32	.76	1.92	1.94	21.54
2393	10.91	9.24	2.51	11.75	.74	1.81	2.08	20.64
2494	11.48	7.96	2.43	10.39	3.13	1.67	2.27	18.88
2715	12.12	6.49	3.66	10.15	3.30	1.58	1.93	17.86
2716	11.45	6.96	3.09	10.05	3.57	1.71	2.00	18.30
2717	10.81	8.48	2.72	11.20	2.47	1.78	2.11	19.94
2718	11.74	8.37	2.51	10.88	2.81	1.70	2.34	19.58
2719	11.52	9.25	2.29	11.54	1.96	1.87	2.30	20.84
2784	10.24	6.36	3.89	10.25	3.10	1.80	2.16	18.90

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
2785	Scott's Gossypium Phospho	Myers & Egger, Columbus
		Average
		Guarantee
2493	Scott's State St'd Guano	J. L. Bufkin & Son, Vossburg
2611	Scott's State St'd Guano	J. L. Moyse & Bro., Summit
2612	Scott's State St'd Guano	Holmes Bros. McComb City
		Average
		Guarantee
2419	Scott's Potasso Phospho	J. Niles Boyd, Kosciusko
2473	Scott's Potasso Phospho	N. B. Langford, Canton
		Average
		Guarantee
2540	Scott's Am. Bone	J. E. Byrd, Mt. Olive
		Guarantee
2610	Scott's Meal Formula	McComb City Mer. Co., McComb City
		Guarantee
2391	Royal H. G. Guano	Viverett & Dear, Newton
2418	Royal H. G. Guano	N. B. Gilliland & Co., Kosciusko
		Average
		Guarantee
2392	Royal Cotton Boll Guano	Viverett & Dear, Newton
2460	Royal Cotton Boll Guano	Parsons, Moreton-Wentworth Co., Brookhaven
2714	Royal Cotton Boll Guano	Donald Bros., Magee
		Average
		Guarantee
2471	Royal Animal Bone Guano	Hyman Mer. Co., Summit
2589	Royal Animal Bone Guano	Wm. Atkinson & McDonald, Wesson
		Average
		Guarantee
2459	Royal Blood, Bone & Potash	Parsons, Moreton-Wentworth Co., Brookhaven
2539	Royal Blood, Bone & Potash	J. P. Myer Mer. Co., Taylorsville
2566	Royal Blood, Bone & Potash	L. L. Anderson, Shuqualak
		Average
		Guarantee
2472	Royal Vegetable Fertilizer	D. H. Jones, Terry
2720	Royal Vegetable Fertilizer	McCullar, Peeler & Co., Booneville
		Average
		Guarantee
2800	Genuine German Kainit	Viverett & Dear, Newton
		Guarantee

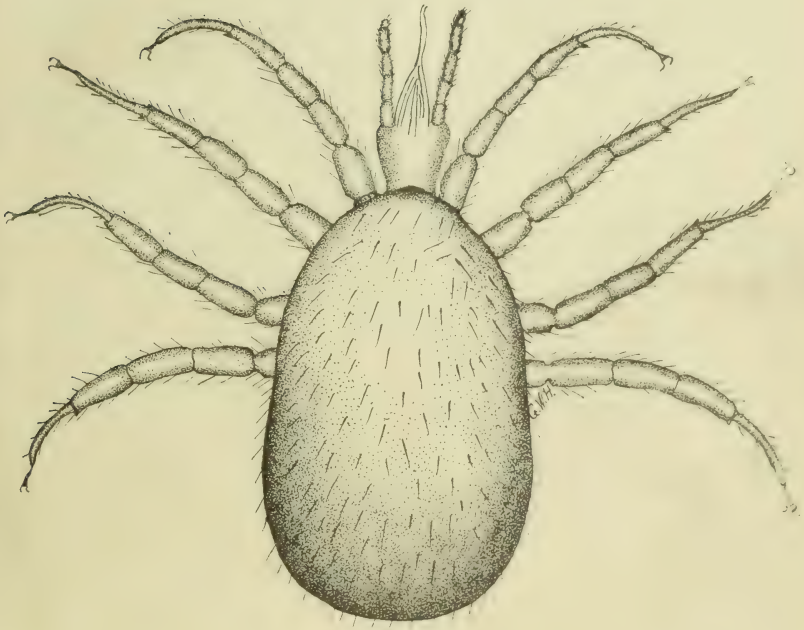
Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2785	11.10	7.01	3.22	10.23	3.45	1.66	1.97	$18.30
	11.23	**8.05**	**2.83**	**10.88**	**2.53**	**1.75**	**2.11**	**19.48**
		7.00	*3.00*	*10.00*	*2.00*	*1.65*	*2.00*	*18.06*
2493	8.69	4.77	3.70	8.47	3.58	1.72	1.95	16.49
2611	7.47	3.84	5.23	9.07	2.93	1.62	1.99	16.71
2612	9.34	5.96	2.95	8.91	4.11	1.67	2.13	17.06
	8.50	**4.86**	**3.96**	**8.82**	**3.54**	**1.67**	**2.02**	**16.75**
		7.00	*1.00*	*8.00*	*2.00*	*1.65*	*2.00*	*16.06*
2419	11.84	6.00	7.51	13.51	1.18		2.29	16.40
2473	11.72	7.79	6.12	13.91	1.65		1.84	16.53
	11.78	**6.90**	**6.81**	**13.71**	**1.42**		**2.07**	**16.47**
		10.00	*2.00*	*12.00*	*2.00*		*2.00*	*15.00*
2540	8.60	6.22	4.11	10.33	2.70	1.76	1.23	17.90
		6.00	*3.00*	*9.00*	*2.00*	*1.65*	*1.00*	*15.96*
2610	9.47	6.14	5.26	11.40	2.67	1.07	1.19	16.68
		8.00	*2.00*	*10.00*	*2.00*	*.82*	*1.00*	*14.47*
2391	11.25	8.14	3.02	11.16	2.23	1.68	2.16	19.59
2418	10.53	7.83	3.26	11.09	2.62	1.69	2.15	19.52
	10.89	**7.99**	**3.14**	**11.13**	**2.43**	**1.69**	**2.15**	**19.56**
		7.00	*3.00*	*10.00*	*2.00*	*1.65*	*2.00*	*18.06*
2392	9.18	6.33	3.20	9.53	3.89	1.65	2.40	17.93
2460	7.47	5.50	3.36	8.86	3.77	1.74	1.98	17.05
2714	8.11	5.07	3.44	8.51	3.86	1.83	2.17	17.13
	8.25	**5.63**	**3.33**	**8.97**	**3.84**	**1.74**	**2.18**	**17.37**
		7.00	*1.00*	*8.00*	*2.00*	*1.65*	*2.00*	*16.06*
2471	8.38	6.87	2.55	9.42	5.46	1.79	1.35	17.28
2589	9.79	6.69	2.53	9.22	5.21	1.74	1.64	17.18
	9.09	**6.78**	**2.54**	**9.32**	**5.34**	**1.77**	**1.69**	**17.23**
		6.00	*3.00*	*9.00*	*2.00*	*1.65*	*1.00*	*15.96*
2459	10.51	8.87	2.60	11.47	2.69	1.00	.92	16.53
2539	10.52	7.98	2.21	10.19	5.58	.85	1.06	14.81
2566	10.90	7.89	3.02	10.91	4.94	.92	.92	15.61
	10.64	**8.25**	**2.61**	**10.86**	**4.40**	**.92**	**.97**	**15.65**
		8.00	*2.00*	*10.00*	*2.00*	*.82*	*1.00*	*14.47*
2472	8.95	8.69	2.05	10.74	.63	3.80	5.20	29 16
2720	7.22	7.92	2.07	9.99	.97	.91	3.75	27.24
	8.09	**8.31**	**2.06**	**10.37**	**.80**	**3.86**	**4.47**	**28.20**
		7.00	*1.00*	*8.00*	*2.00*	*3.30*	*4.00*	*23.43*
2800	1.87						13.14	13.14
							12.00	*12.00*

Mississippi Agricultural Experiment Station.

BULLETIN No. 78.

THE CHICKEN MITE.

By GLENN W. HERRICK.



AGRICULTURAL COLLEGE, MISS.,

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MISSISSIPPI STATIONERY CO., YAZOO CITY.

THE CHICKEN MITE.

So far as the author is aware, there is no one disease or parasite of poultry in this State that causes so much trouble, or so much financial loss to those that grow chickens either for the home table or for the market, as the chicken mite (Dermanyssus gallinae). As the illustration on the cover shows, it has an oval shaped body with four pairs of rather long slender legs. Its general appearance is much like that of a tick and in fact it is closely related to the ticks of cattle, sheep, etc. It is a little less than one twenty-fifth of an inch long but is plainly visible to the naked eye.

When full of blood its body is plainly red in color but normally it is rather light gray. The tiny jaws of the mite are formed for sucking and the pest lives by sucking the blood from its host. It is also probably able to live upon the moisture and other materials found in decaying substances and droppings. It is almost impossible to set a hen, under ordinary conditions, after the first of May in this latitude without in a few days finding the nest simply swarming with multitudes of these little parasites. If allowed to go undisturbed the hen in sheer desperation will leave the nest which is a sufficient sign of their ability to cause trouble, for when a "settin" hen leaves a nest of her own accord there must be a tremendous provocation. I have seen the mites so numerous that they actually hung in festoons about the sides of the nest boxes. In such cases if the sitting hen be in the same house with the laying hens the mites will spread over the roosts and become abundant everywhere, after

*We have not yet succeeded in working out the life history of this mite and as nothing much is known of it, we simply pass that by for the time being.

which it is difficult to get rid of them. They are very annoying to persons, getting on the hands and body, thereby causing the most uncomfortable and unpleasant sensations. In fact when they grow so very numerous in the vicinity of horse or cow stables they often become of considerable annoyance to these domestic animals.

Filth and lack of light as a cause of the great increase of these pests.—From my work with the chicken mite extending over two years, I am convinced that the most potent cause of the presence and increase of these parasites is filth under which may be included, droppings, decaying and decayed eggs and bits of decayed material of almost any kind. The young mites which may be recognized by their lighter color are found in immense numbers in the filth that has sifted through the straw and lies in the bottom and in the corners and cracks of the nest. If a partly hatched egg happens to be broken in the nest the mites literally swarm over it. The filthier a nest becomes from droppings and broken eggs the more abundant become the mites.

Lack of light is another cause of the presence and increase of the mites. Most people believe that any thing will answer for a poultry house. It is seldom indeed, that a window is put in, and the only light that enters finds its way through cracks and a small door which may or may not be allowed to stand open. No wonder that mites and other parasites develop in such a house. Some people maintain that the only way to get rid of mites is to have no roof on the house but to allow the wind and weather full access to all parts of the roosts and nests. In the first place, this is exceedingly ill treatment for the poultry, and in the second place, I believe the efficacy of such treatment lies in the great flood of light and sunshine that enters the house and which may be obtained in a more humane way, namely, through glass windows or windows that may, at least, be closed in a storm or in the coldest weather. Where sash and glass cannot be had to close the opening, a hinged door, like the one shown in figure II, that can be closed in stormy weather or at night, may be easily made. If desired, poultry wire netting may be nailed over the opening to exclude owls, foxes, etc., and to shut in any fowls that one may

wish to keep up at any time. Such an arrangement will give the desired light and air, which will have a most salutary effect in keeping the house dry and free from disease germs. The house should be high and roomy so that one can walk in and go about with some degree

Fig. II.—Showing Chicken house with large doors on the sides to admit light and air on warm sunny days. Note the openings closed with poultry wire netting.

of comfort and pleasure. It is a place that one should visit every day for the purpose of giving it some attention. A poultry house

that one has to crawl through a small door to enter and then go groping around in darkness half bent to the ground for fear of bumping one's head against the roof will receive very few visits and very scant attention.

Nests.—Early in my experiments, it became evident that cleanliness was of prime importance and that access must be had to every crack and crevice in the nest boxes especially, in order that every

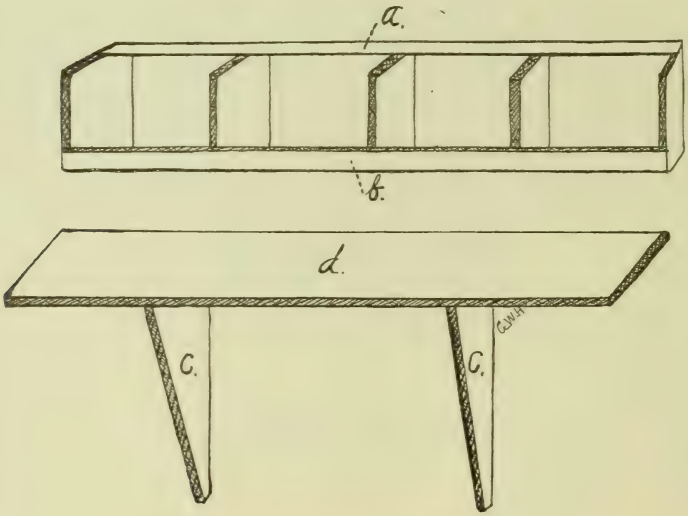


Fig. III.—Showing nest boxes and supports. The pieces c, c, are the only ones fastened to the building.

bit of filth might be removed and that every part of the boxes might be treated so that no mites could escape by hiding away in the nooks and crannies. To this end I devised a method of building the nest boxes as follows: from a board, one inch by twelve inches, pieces one foot long were cut to form the partitions between the nests. To hold them upright and in position, a piece one inch by three inches was nailed across the top, even with the back ends of the partitions and

another piece of the same size in front, even with the lower edges of the partitions. These pieces are shown at a, and b, in figure III. Against the side of the house two supports (c, c),—of any desired height—were nailed and on this a twelve inch board (d) was laid to form the bottom of the nests. The only portion of these nest boxes that was fastened to the house was the supports (c, c). Consequently the whole thing could be removed at any time and since there were very few corners and cracks in which dirt could accumulate the nest boxes could be easily and thoroughly cleaned and every part treated to an application of any desired substance.

Roosts.—Here again it was our desire to have something for the hens to roost upon that could be easily and thoroughly cleaned

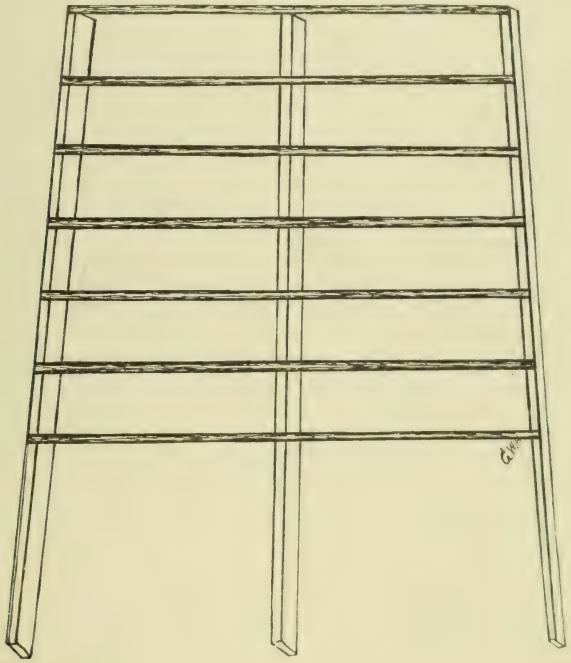


Fig. IV.—Showing the simple perches that may be easily removed from the house at any time.

and treated. Ordinarily, perches are nailed to the house and usually in such a position that one cannot get at them for the purpose of cleaning them or around them for the purpose of cleaning the floor beneath. In constructing the roosts for our work three pieces, each one inch by three inches, were placed at an equal distance apart and across these were nailed, at intervals of one foot, poles cut from young saplings in the woods. The whole is shown in figure IV. Of course the width of the perches and the height will be determined by the size of the poultry house and the number of hens to occupy them. Moreover instead of nailing the roosts to the house they were stood against the end of the house at an angle sufficient to protect the lower rows of the fowls from the droppings of those above. By this arrangement the perches could be removed from the house at any time and every part carefully cleaned while at the same time the house was made clear of any obstructions in the way of cleaning it.

Inside of house.—The whole object in planning the inside of the poultry house was to maintain it free from anything that might afford a hiding place for the mites and prevent their being reached by whatever insecticides we chose to use. The foregoing plan of arranging the perches and nest boxes gave an opportunity of removing everything from the house except the supports for the nest boxes, thus leaving practically four bare walls that could be treated with ease and with thoroughness. With such a house even though it become infested with myriads of mites it would be possible, I believe, to get rid of them. Every part of the walls could be easily treated with whitewash, carbolic acid, kerosene or any other substance so that hardly a mite could escape. Besides, the treatment is so easy that several applications could be made, if necessary, without any great labor or loss of time.

Direct remedies.—There are all sorts of substances recommended for destroying and preventing chicken mites and many of them are of value. We pinned our faith to three principal ones after having built our house according to the above suggestions. The house was 8x10 with a shingle roof and cost a trifle over twelve dollars complete, certainly within the reach of every farmer. In fact

the same house would not cost the average farmer nearly so much because he could build it himself.

Cleaning, together with lime and sulphur.—Once every *two weeks* the perches were removed and cleaned and the house thoroughly swept out. Every bit of dirt and droppings was swept from the house and the roosts were then replaced. Then a mixture of dry air-slacked lime three parts, and sulphur one part, was thrown into the air, up to the roof—the windows being closed—on the perches, against the sides of the house, etc., until the atmosphere inside the house was filled with lime and sulphur. This was allowed to settle as it willed much of it falling into the nests and on the sitting hens, for of course they were not removed. The floor (earth) was given special attention and a quantity of lime and sulphur was scattered over it both to kill any mites that might be there and to dry out the moisture caused by the droppings. This method of procedure was kept up all through the season of chicken raising. When a house is once thoroughly infested with mites this cleaning will have to be done oftener, at least until the house is once free from them. I believe that ordinarily once a week is better than once in two weeks. *A chicken house cannot be kept too clean.*

Crude petroleum or kerosene.—For destroying those insects that have to be killed by applications to the outside of the body or as we say by contact, crude petroleum is becoming one of the most effective substances known. It retains that odor, peculiar to itself, for a longer time than kerosene and with certain insects this is without doubt efficacious in repelling them. Moreover it does not evaporate as readily as kerosene and maintains its greasy qualities much longer thereby lessening the need for so frequent applications. Chicken mites are quickly killed when actually coated with crude petroleum.

In my work with the chicken mite, crude petroleum was used freely and often. Before setting a hen the old straw in the nest was always burned and the nest thoroughly cleaned, by removing the partitions, thus giving access to every part of the nest as we have already shown in our description of the structure of the nests Then

every part of the bottom plank and partitions, outside and inside, was given a coat of crude petroleum. In this way one can be assured that the nests, at least, are free from mites to begin with, an important consideration. The oil was applied by hand with an old rag. Of course it may be sprayed on with a spray pump but there is no advantage in the latter over the former so far as could be seen. After treating the nests to the oil they were put in place, new straw put in and in the bottom of the nest were placed six to ten moth balls or camphor balls. The nests retain the odor of the oil for days and even weeks, but more than that the greasiness of the oil, sufficient to cause the death of the mites is retained on the nests for a considerable interval. Although mites existed in abundance in the early stages of our experiment in the nests of the sitting hens we were able to get rid of them and to remain free of them thereafter by the use of the foregoing remedies. I am not prepared to say just what effect the moth balls had as they were not tried alone. I should urgently advise putting some of the lime and sulphur in the bottoms of the nests before putting in the straw.

It is not convenient perhaps for everyone to use crude petroleum because it is not easily obtainable, although if several farmers in a neighborhood would get together and ask their grocer to order a barrel he would no doubt, be glad to do so. When crude petroleum is not obtainable ordinary kerosene oil may be used instead. It is just as effective in destroying the mites but evaporates more quickly, thus losing its odor and greasy qualities sooner than crude petroleum.

Dust bath for hens.—It is a common sight to see hens and chickens literally wallowing in the dry dust. They manage to form a hollow place in the ground to conform with the body and in this they lie, scratching with the feet, fluttering the wings, and elevating the feathers until they stand all fluffy, and loose over the body. By scratching, the fowls loosen and pulverize the soil which is worked down in among the feathers. This practice among fowls is not done wholly for pleasure although they apparently enjoy it. The fine dust is an excellent insecticide for it gets into the breathing

pores of insects stopping up these openings thereby causing death. There can be no doubt that this wallowing in the dust is instinctive with the hen whereby she keeps herself free from lice and mites. There are seasons of the year when fowls cannot find dry dusty places in which to wallow, therefore one should be provided for them by filling a large shallow box with road dust and setting it where it will keep dry but where as much light and sunshine as possible can reach it.

To clear an infested house of mites.—It often happens that a poultry house becomes infested with mites from floor to roof and in every nook and cranny of the building. If the house is not too valuable a very good way of getting rid of them is to burn it and build anew. If this cannot be afforded then tear out all the roosts and nests leaving only the four bare walls. Clean it out thoroughly from top to bottom, treat it with kerosene or crude petroleum applied with a spray pump and give it two good fumigations forty-eight hours apart with sulphur burned on live coals. Follow this treatment with lime and sulphur as often as twice a week for two or three weeks. It is best to build new perches and nests. If the old ones are put back they should be thoroughly cleaned, washed with *boiling* water and then treated carefully with kerosene.

Isolation of poultry house.—We have already referred to the fact that at times, when fowls roost in a barn or in a room adjoining the horse or cow stalls mites become troublesome to these animals and to man as well whenever he goes into the stalls. For this reason poultry houses should be set some distance from the other farm buildings.

Isolation of sitting hens.—All of our work with the mite was done in a house containing both the laying hens and sitting hens. This was done because these are the conditions under which most hens are set in this State. It is however much more desirable to have the sitting hens apart by themselves in a separate room or even separate building. A lady from Missouri writing for an agricultural paper speaks as follows: "My hens are all set in a room

fitted up for that purpose with nests like those in which they lay. When one is ready to sit, and her service is wanted, a clean box treated with kerosene and carbolic acid is sprinkled with lime and a good, soft nest built therein generally of dry grass." Some people practice setting their hens in boxes here and there around the yard. This is unnecessary and unnecessarily exposes the hen to rain and storm. It must be remembered that even though the sitting hens be placed by themselves they must be attended to just as thoroughly as otherwise and the same treatment given to the room and nests as under other conditions.

Selection and treatment of the sitting hen.—The first requisite to success in raising chickens is the selection of the right kind of a brood hen; and we are speaking now only from the point of view of keeping rid of mites, yet look at it from any point of view and the hen plays an important role in the final result. A quiet, motherly, easily handled hen should be selected, because it may happen that she will need to be removed and the eggs washed or nest cleaned. It not unfrequently happens that an egg gets broken. If so it should be removed and the others with which it came in contact washed in warm water but wiped dry before putting back under the hen. If droppings occur in the nest these should be removed. It is well, if the house is not treated with lime and sulphur as described, to dust insect powder on the hen, at least once a week. With the foregoing precautions and with the right kind of a hen no one ought to meet with much trouble from chicken mites.

Summary.—To keep free of chicken mites, first of all, build a roomy, well-lighted, well-ventilated poultry house.

Arrange it so that the perches and nest boxes can be removed and easily cleaned.

Keep the house as clean inside as is possible.

Treat as often as once in two weeks, at least, with dry, air-slaked lime and sulphur.

Before setting a hen treat the nest boxes to a coat of crude pe-

troleum or kerosene and put lime and sulphur in the bottom of the nest boxes.

Burn the straw after a hen is through sitting.

Give a sitting hen some attention and keep the nest clean.

Place in the nest half a dozen moth balls taking care that they do not touch the eggs.

Mississippi Agricultural Experiment Station.
BULLETIN No. 79.

Report of Work at McNeill Branch Station for 1902.

By E. B. FERRIS.

FIGURE 1. TYPICAL PINE FOREST.

AGRICULTURAL COLLEGE, MISS., JANUARY, 1903.

MISSISSIPPI STATIONERY CO., YAZOO CITY.

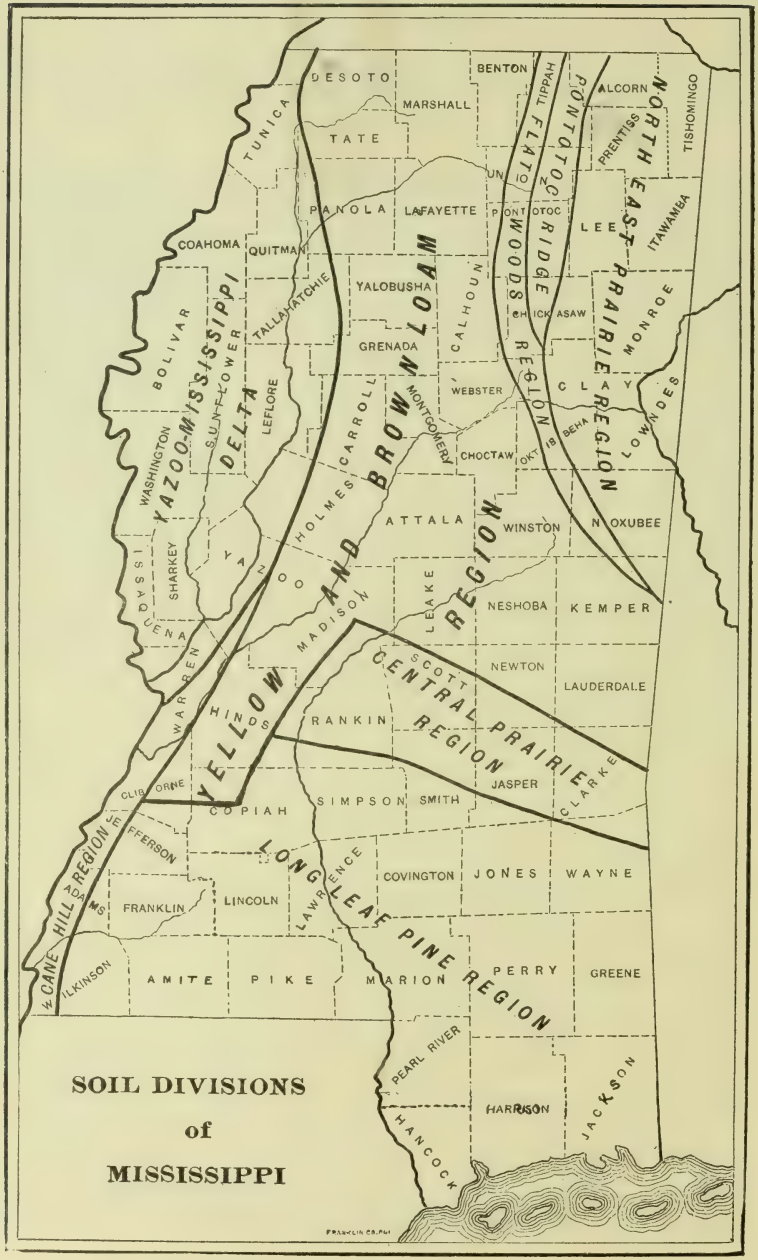


FIGURE 2. SOIL MAP OF MISSISSIPPI.

A REPORT OF WORK AT McNEILL BRANCH EXPERIMENT STATION FOR 1902.

Introduction.—McNeill is situated on the New Orleans and Northeastern Railroad in Pearl River County, being only twelve miles from the Louisiana line and fifty-seven miles from the city of New Orleans. It is in the long leaf pine region and has a soil similar to that which constitutes all or a part of sixteen or more counties in Mississippi.

This pine-woods section of the State was for a long time looked upon as almost entirely worthless and only in very recent years has its lands brought anything like their true value. Even now, taking the region as a whole, the value of these lands is based principally on the timber on them which frequently sells for eighteen and twenty dollars an acre.

Fig. I shows a typical pine forest before the trees have been cut for timber. Saw mills and turpentine stills occur every few miles. There are four saw mills within two miles of McNeill, all of which have been in operation less than eignt months.

The lands left after the saw mill timber has been removed, known as "Cut-over Pine Lands," have heretofore had little value—frequently reverting back to the State because the owner would not pay the taxes.

It was to show the value of these lands for agricultural purposes that the last legislature appropriated money for the support of a branch experiment station.

The map shown in Fig. 2 will give the reader an idea of the extent of the Long Leaf Pine Region of Mississippi, and it is for the especial help of the farmers within this area and for those that are to come that this station was established.

Generally speaking lumber and turpentine have heretofore commanded the best talent in this section. Those who have engaged in agriculture have found it so easy to live from their flocks and herds

and sweet potato patches that general farming has not received the attention it might have had with profit. However, some of the best farmers of the State may be found in the pine-woods region and it goes to show that these lands have considerable agricultural value when we find them under intelligent care and management, making a bale of cotton or forty bushels of corn to the acre.

Station grounds.—The station owns two thousand acres of cut-over pine land in the vicinity of McNeill. The principal work of the Station, however, will be done on one hundred and sixty acres fronting one-half mile on the railroad and running the same distance back.

Figure 3 gives a general idea of the arrangement of the grounds and buildings.

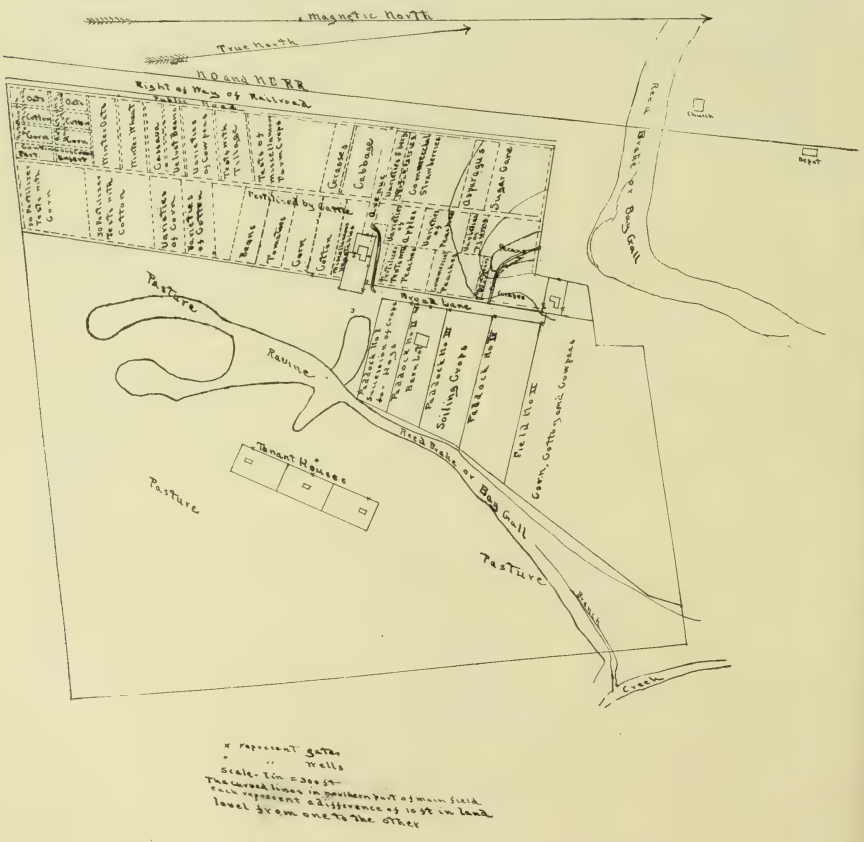


FIGURE 3.—TRAVERSE MAP OF STATION GROUND.

The soil is a dark sandy loam underlaid principally by a red sandy clay subsoil though in places this red foundation gives place to one of a yellowish cast.

The soil further back from the railroad varies somewhat from the general type described, in having more sand in both the surface and subsoil. A large bay gall commences just back, or east, of the residence, and getting broader as it goes in a north-easterly direction, attains a width of 200 yards in one corner of the enclosure. The numerous springs in the bay gall supply enough water for a bold branch at all seasons of the year.

General statement.—Work was bugun at McNeill on the 21st of March, 1902. Prior to this time thirty-five acres of land had been fenced and five acres of this cleared. A two-story residence had also been partially completed. No stumps had been removed from any of this land. Farm labor had to be imported from other farming sections of the State.

By the end of the year forty acres of land had been cleared of trees and stumps and about fifteen acres more had been practically gotten ready for the plow.

Thirty-five acres of this land had been cultivated and on a good portion of it two different crops had been gathered, such as corn and cowpeas, beans, and sweet potatoes, and second cuttings from both sorghum and cowpeas.

The station residence has been completed and the following houses built:—A neat four room cottage for foreman, a large and commodious barn and packing house, and three two-room cabins for the laborers. It has also been necessary to build three additional miles of fence. The fences are put up with woven wire 34 inches high, having two barbed wires on top.

The most of the cultivation of the crops and general hauling has been done with a pair of mules, but during the summer a pair of mares were bought from which to raise mule colts and do the lighter work of the farm. The two teams are shown in the cut illustrating the barn. There is no one feature about farming so neglected in the South as that of raising the necessary work stock. By fencing a few spare acres and providing a good pasture, mares could apparently be made to do the lighter farm work and at the same time raise a colt each year, that need not cost at two years old more than $25.00. Such a mule at present prices would sell for $75.00 if he was what he

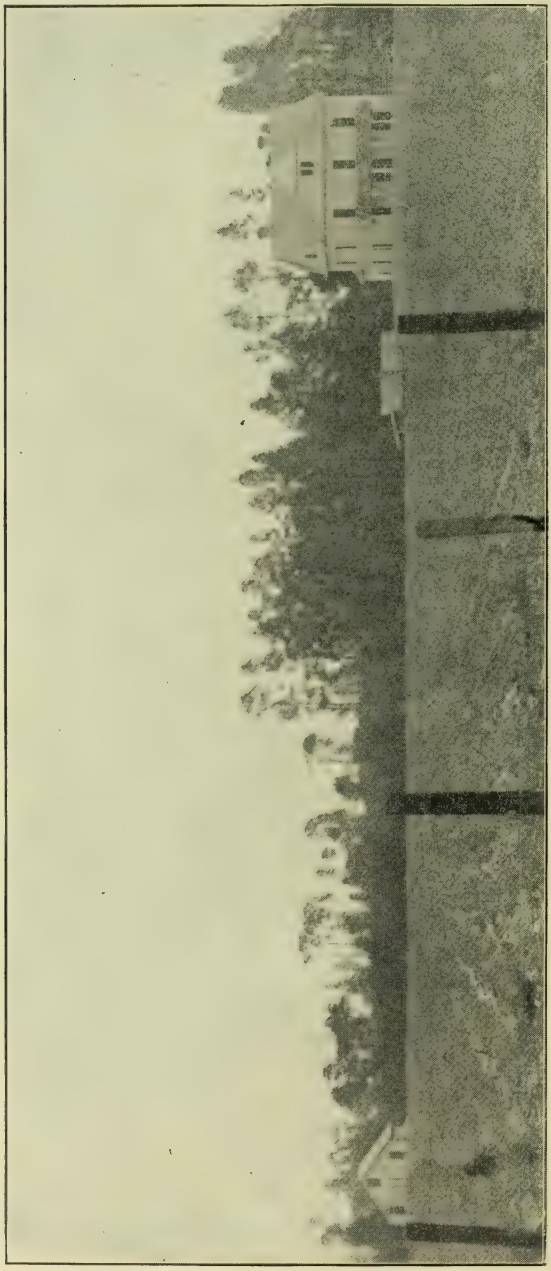


FIGURE 4.—SHOWING RESIDENCE, BARN AND NORTH END OF STATION GROUNDS.

should be. This station hopes, therefore, to get valuable information along this line and that farmers may be induced to raise their work animals.

Clearing cut-over pine lands.—(*Tree tops, logs, and small trees.*)—It is frequently the case where lands are in close proximity to a railroad that the tree tops, logs, and small trees will pay a good deal of the expense for clearing. Where the small timber is thick enough coal burners will clear it entirely and pay a fair price for the privilege while large quantities of baker's pine may be gotten from most any cut-over land. These products find ready sale at fair prices in the New Orleans market.

In most instances it is best, in our opinion, to simply get the land ready for the plow by removing surface impediments and to leave the stumps for some future time. These stumps interfere much less with the cultivation of crops than one would think from a casual observation.

The lateral roots are all quite brittle and are soon broken to pieces and entirely removed by rotting, then the stumps are little more in the way than so many stobs of the same size driven in the ground. It is after these roots have rotted and the body becomes perfectly dry that the stumps may be removed most economically by any method that may be tried.

Removing stumps.—The nature of our work is such that it was necessary to have the land free of stumps, for in all experiments, small plats are used and any errors or differences caused by the stumps would be multiplied in reducing the results to acres. One twentieth acre plats were the sizes most frequently used. A number of different ways have been employed to get rid of these stumps.

Not being able to wait for nature to do her part we have been compelled to do a great deal more work than would have been necessary if the land could have been worked several years before attempting to get the stumps out.

Stump puller.—A stump puller was ordered on trial which did not work successfully. Its failure may have been caused by the extreme dryness and compactness of the ground at the time it was being used, but it is our opinion that anything strong enough to pull the average pine stump in this section would be too heavy to move about with any facility.

FIGURE 5.—CLEARING SOUTH END OF EXPERIMENT FIELD.

We used a two-horse machine with a lever arm short enough that no amount of pulling two good mules could do was able to break it, yet the stumps refused to be moved.

It did succeed in pulling some very large stumps, but only after all lateral roots had been cut and a wide and deep hole dug on the side towards which the stump was being pulled.

The tap roots of these stumps are frequently eight feet long and when burried in a compact clay subsoil, they can withstand almost any pulling force, especially when it draws to one side.

Because these machines did not pull green stumps successfully is no reason why they should not be a great boon to the farmers in this section in ridding their fields of all the old stumps, for it is after the lateral roots have rotted, and the surface sap decayed that these machines will do their best work.

Blasting with dynamite.—The bulk of the land has been cleared by boring a hole with an inch and a half auger, from the surface down into the tap root, and blasting with forty per cent dynamite.

The initial cost is rather heavy, but where the stumps are green and labor is such an important item as it was with us it is the cheapest and most satisfactory way.

The hole is commenced at, or just below the surface of the ground, and bored at an angle of forty-five degrees with the stump or ground, for from fifteen to twenty inches into the tap root. Into this hole a quarter or half pound stick of dynamite is placed, well tamped, and then exploded. It seldom throws a stump out of the ground, but so shatters it that it may be burned out with comparative ease. Our method was, after blasting, to expose the roots by removing the dirt from all sides of the stump to about six inches deep. The dirt is easily removed since the jar from the explosion of the dynamite loosens it well around for several inches. A few logs were then piled around each stump and in this way the stumps and logs helped to burn each other—the fire being easily started in the fat pine exposed by blasting, and the logs furnishing additional fuel to burn those parts of the stump that may have escaped complete shattering. Stumps less than eight inches in diameter were grubbed and cut off with an axe, preferably before the tree was cut. Up to fourteen inches only one-fourth pound of dynamite was used; above fourteen, one-half pound was found necessary, while there were always several stumps

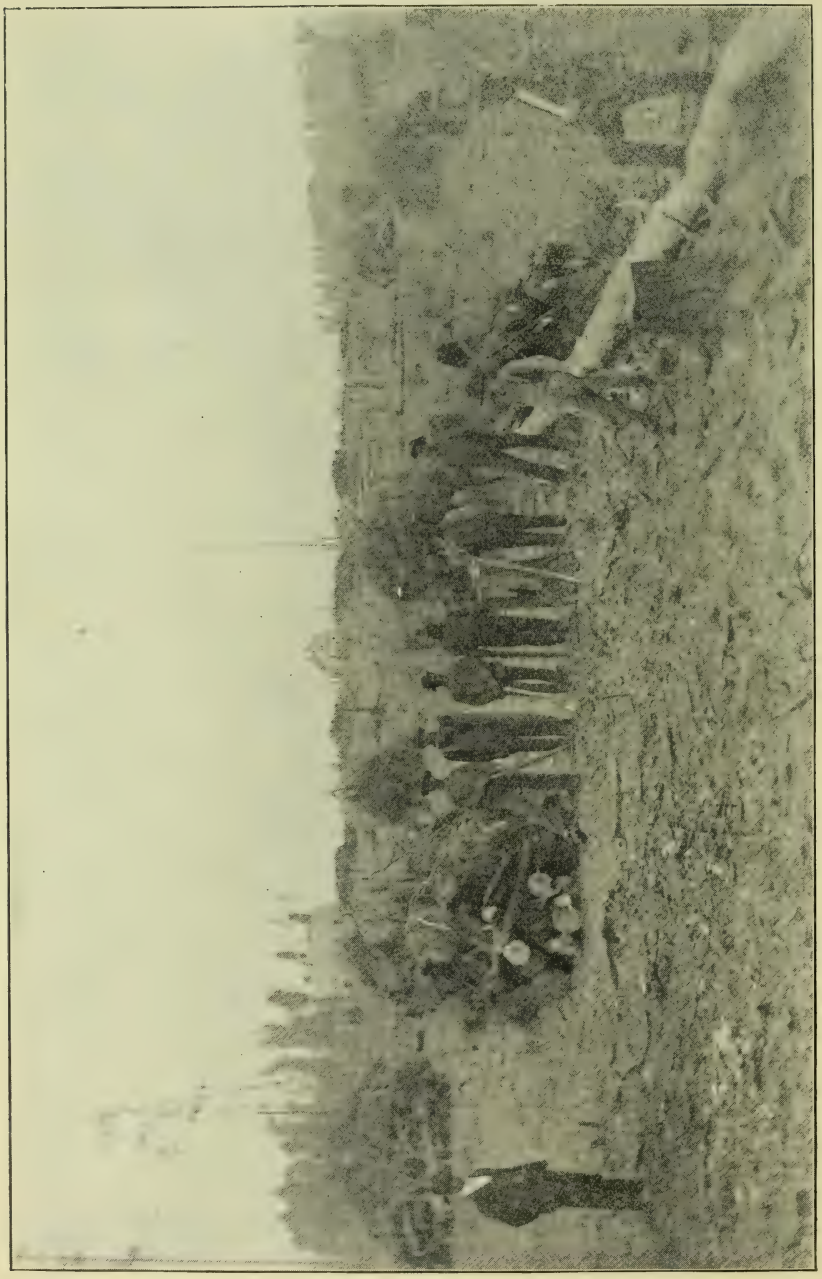


FIGURE 6.—CLEARING FIELD NORTH-EAST OF BARN.

on an acre that required two borings and one pound of dynamite.

This dynamite is exploded by cap and fuse or by an electric battery, and when properly handled is entirely harmless. It is exploded only by a concussion or jar and may be placed in a fire where it will disappear as harmless as if it were a pine stick. We have frequently had two charges in the same stump when the explosion of one would not affect the other. Each charge requires a cap and from six to ten inches of fuse.

Burning.—Where the stumps have had several years to dry they may be burned very easily, without blasting, by digging a hole fifteen or twenty inches deep on one side of the stump, exposing as much of the tap root as possible by removing the dirt from around it, and then with a slow but continuous fire gradually burn it off beneath the surface of the ground. An ordinary post hole digger, supplemented by a turpentine dipper, for removing the dirt in places where the other will not reach, make an ideal outfit for this work.

After starting, the fires should be kept up in the holes with pine knots or some material that will all be consumed and leave little residue to fill up the hole. After these fires have burnt well into the stump, ordinary pine logs or burned off stumps may be used to complete the destruction. One hand should dig from forty to fifty holes a day and it would require another man from two to three days to do the burning.

It is almost useless, however, to say what a man should do in such work—it depends so much on the size and degree of dryness of stumps as well as on the individual aptitude of the worker.

After starting to burn stumps it is best that the fires should never be allowed to go out until they have accomplished their purpose, and for this reason it would always be best to keep a hand firing them at night.

It seems too that they burn more rapidly at night than during the day.

Burning with auger hole as a flue.—If, after digging the hole on one side of the stump as described above, you bore from the surface of the ground, on the opposite side, an auger hole through the stump and down into the fire chamber, the destruction may be accomplished much more quickly.

This hole serves as a flue through which the heat and flames may

FIGURE 7. NIGHT SCENE—BURNING STUMPS AND LOGS.

pass, increasing the surface to which the fire has access very rapidly.

These pine stumps are usually very combustible and burn quite readily whenever the air has free access to the fire. In fact they are of the richest pine and when torn to pieces by machinery make a very necessary article of commerce—the kindling being sold regularly in all cities.

There is a machine made especially for boring stumps as described, but we have been unable to obtain one for our use.

The Colquitt method.—Another method tried is one gotten up by ex-Governor Colquitt, of Georgia. This is supposed to burn the stump by placing over it a large iron cone. After the fire is started in the hole beside the stump, the cone is placed over it and draws the heat around the stump before it escapes at the top.

We tried these cones, which were loaned us by Mr. Prentiss of Poplarville, Miss., on several stumps but could never make them do more than burn the stump off at the surface of the ground, leaving the roots as much in the way as ever.

Besides, the great majority of our stumps were too high for these particular cones to be of any service whatever until the tops had been sawed off nearer the surface of the ground.

Other methods.—It is hardly worth while to mention digging up these stumps though a few were gotten rid of in that way. Two or three medium size stumps were an average day's work for each laborer.

We intend trying the methods of burning by first saturating the stumps with kerosene oil and also by hastening their decay with Nitrate of Soda.

From now on the land cleared will be worked for several years without removing the stumps, after which time we will again try a stump puller and repeat the various ways already tried with comparatively green stumps.

Cost of clearing.—We are frequently asked the question as to how much it will cost to clear these lands of stumps.

An exact answer cannot be given to such a question without going too much into details.

We would consider that boring the auger holes for the dynamite

FIGURE 8.—COLQUITT CONES.

and digging the hole beside the stump for firing to be about equal in cost when the stumps are yet in a comparatively green state.

It was found that fifty such holes was all we could expect of one man in a day, though most farmers doing their own work would probably do more.

The dynamite used cost 13½ cents per pound, the caps, 75 cents per hundred, and fuse, 65 cents per hundred feet. It will require one cap and about six inches of fuse for each charge which is one-fourth to one-half pound of dynamite. The cost of clearing then will depend entirely on the number and size of stumps on each acre, their degree of dryness and soundness, and the disposition that may be made of the timber on the land, left after the saw logs are removed.

PLAT EXPERIMENTS.

Fertilizers.—A large part of the commercial fertiltzers sold in this State are used on lands within the boundaries of the long leaf pine region. No systematic or exhaustive work has yet been done to study the plant food requirements of these soils.

One of the main efforts, therefore, of this station will be to study this question thoroughly and determine not only the most economical way to use commercial fertilizers, but the value of legumious crops and animal excrement both in the form of stable manure and the droppings of animals on the soil parked.

Thirty head of steers were bought on November 6th, and are being parked on five acres of land and fed for one hundred days on cottonseed products. It is hoped to get the manure as a clear profit on the investment.

This land will be so handled in the future that an intelligent idea may be had as to what part of the theoretical value may in practice be gotten from the manure.

One great trouble with experiments similar to this conducted at the A. & M. College has been that the tramping of cattle in wet weather did the land almost as much harm as the manure did good. On these soils where plant food is badly needed and where the tramping produces no ill effects, the maximum value should be gotten from all the manure voided.

The proper manner of fertilizing these soils has been made one of the most prominent features in our work with the different crops grown.

Beans.—One of the first pieces of work was to clear the logs and trash from an acre of land and plant beans without removing the stumps.

The presence of so many of these stumps prevented the division of the acre into very small plats and we only tested four different ways of fertilizing, using one-fourth of an acre for each test.

One thousand pounds of mixed fertilizer, containing three per cent of Nitrogen, seven per cent of Phosphoric Acid, and three per cent of Potash, was taken as representing about the quantity per acre used by farmers for vegetables and also the quality of fertilizer.

One-half the Nitrogen was furnished in cottonseed meal, the other half in dried blood, and the Phosphoric Acid and Potash were supplied from Acid Phosphate and Kainit respectively.

The cottonseed meal was bought under a guarantee of seven per cent Nitrogen, the dried blood fourteen per cent Nitrogen, the acid phosphate fourteen per cent Available Phosphoric Acid, most of it soluble in water, and the kainit twelve per cent actual Potash.

In each instance the amount of Phosphoric Acid and Potash contained in the cottonseed meal was taken into consideration.

These beans were planted on the first day of April and the following table gives the amount and kind of fertilizer used, the different dates of each picking, the cost of fertilizer per acre, and the value of the beans at fifty cents per bushel:

RESULTS WITH BEANS.

No. of Plat.	Amount of Fertilizer Per Quarter Acre Plat.	Variety of Beans	First Picking, May 20th.	Second Picking, May 23rd.	Third Picking, May 26th.	Fourth Picking, May 31st.	Fifth Picking, June 3rd.	Sixth Picking, June 30th.	Total Pounds per Plat.	Total Pounds per Acre.	Cost of Fertilizing per Acre.	Value of Beans per Acre at 50c per Bushel.
			Lbs	Lbs	Lbs	Lbs	Lbs	Lbs	Lbs	Lbs		
(1) N. P. K.	54 pounds Cottonseed Meal 27 pounds Dried Blood 114 pounds Acid Phosphate 52 pounds Kainit	Wardwell's Kidney Wax	60	87	51	110	87	11	406	3248	$9.92	$54.00
		Improved Valentine			202	224	52	21	499	3992	9.92	66.50
(2) N. ½ P. K. ½	27 pounds Cottonseed Meal 13.5 pounds Dried Blood 119 pounds Acid Phosphate 25 pounds Kainit	Wardwell's Kidney Wax	46.5	126	55	100	63	10	400	3200	6.60	53.50
		Improved Valentine			238	129	90	12	469	3752	6.60	62.50
(3) ½(N. P. K.)	27 pounds Cottonseed Meal 1.35 pounds Dried Blood 60 pounds Acid Phosphate 25 pounds Kainit	Wardwell's Kidney Wax	47.5	104	56	103	56	16	382	3056	5.00	51.00
		Improved Valentine			213	124	99	27	463	3704	5.00	61.73
(4) N. P.	54 pounds Cottonseed Meal 27 pounds Dried Blood 114 pounds Acid Phosphate	Wardwell's Kidney Wax	100	85	137	110	78	28	538	4304	8.48	71.73
		Improved Valentine			366	97	102	37	602	4816	8.48	80.26

The beans were shipped by Express to the Northern markets and netted approximately fifty cents per bushel of thirty pounds.

It will be noted in the foregoing table that plats one (1) and four (4) were fertilized alike except for the entire absence of Potash in the latter. Why it yielded more than number one, is difficult to say. It is hardly possible that the Potash had any ill effect on the crop. The results, taken as a whole, indicate that large applications of fertilizers to soils in the condition of these do not give most economical results and that more profitable crops may be raised by using five hundred pounds per acre than by using one thousand pounds of a mixture similar to the above.

FIGURE 9.—TURPENTINE ORCHARD. (Courtesy of U. S. Beaureau of Soils.)

Result on varieties —Reference to the table will show that the green beans yielded more than the wax by an average of twenty bushels per acre and that the wax beans were something like one week earlier in maturing.

Our experience in shipping was that they brought practically the same prices, some markets preferring one, while other markets preferred the other.

The wax beans are larger and more easily picked, and make a neater looking package.

Sweet potatoes.—After the beans were gathered the stumps were removed from the land and about the middle of July, the separate plats were planted in sweet potatoes from cuttings of vines.

No additional fertilizer was added. These potatoes were dug on the twentieth of November and gave the following yields, calculated per acre :

Plat 1—130 bushels merchantable and 10 bushels seed potatoes.
Plat 2—149 bushels merchantable and 15 bushels seed potatoes.
Plat 3—152 bushels merchantable and 12 bushels seed potatoes.
Plat 4—136 bushels merchantable and 14 bushels seed potatoes.

Weather.—Except for a few days when the beans were quite young, neither of these crops suffered for rain, nor were they ever injured from any excess of moisture. In fact the climatic conditions were very favorable, the severe drought coming just between the two crops.

Sugar cane.—We reached McNeill too late to get cane seed of good quality, the stalks every where having sprouted badly. Some that was being saved for the Station had been planted a week or more before because it could not be kept longer. However, we secured and planted 800 stalks, hoping to do little more than raise seed for another year. It was planted in rows five feet apart and 267 feet long. Fourteen rows were planted. Three plats of four rows each, separated by one unfertilized row constituted the experiment. A mixture containing three per cent Nitrogen and seven per cent Phosphoric Acid was applied at the rate of 600 pounds per acre. The cane came up to about half a stand on each of the fertilized plats and each had practically the same number of stalks. The two rows unfertilized were planted in poorer canes, and, consequently, had fewer stalks.

The planting was done on April 2nd, the crop was cultivated regularly and cut on November the fourteenth.

The following table shows the results obtained:

No. of Plats.	AMONUT OF FERTILIZER IN POUNDS CALCULATED PER ACRE.	Yield of matured cane in lbs. per acre.
(1)	260 lbs. Cottonseed Meal 243 lbs. Acid Phosphate	22,140
(2)	No Fertilizer	7,205
(3)	390 lbs. Cottonseed Meal 219 lbs. Acid Phosphate	23,733
(4)	No Fertilizer	9,324
(5)	260 lbs. Cottonseed Meal 365 lbs. Acid Phosphate	24,711

Remarks.—The cottonseed meal and Acid Phosphate were from the same lot as that used on the beans and contained seven per cent Nitrogen and fourteen per cent Available Phosphoric Acid respectively. The amount of Phosphoric Acid in the meal was taken into account.

About one-third of an acre of this cane was made into syrup, and the yield was sixty-five and one-half gallons.

We are trying the method of saving the unmatured tops of the cane as used for another year.

Weather.—This cane suffered very much from drought during June and the earlier part of July, though not so much as other crops growing near it.

Corn (*Fertilizer test.*)—Thirty plats of one-twentieth acre each were fertilized in various ways and planted to corn of the Mosby variety on April the sixteenth.

Each plat consisted of four rows four and one-fourth feet wide by one hundred and thirty feet long. A space six feet wide divided the separate plats.

This corn came up to a good stand and grew off nicely, the effect of the different ways of fertilizing being quite apparent. Figure 10 shows the marked difference between a plat unfertilized and one containing a moderately heavy application of Acid Phosphate and cottonseed meal.

This figure illustrates plats eighteen and nineteen at the beginning of the drought.

The following table gives the results and shows that the crop was nearly a complete failure :

RESULTS WITH FURTILIZERS UNDER CORN.

No. of Plat.	AMOUNT OF EERTILIZER CALCULATED IN POUNDS PER ACRE.	Yield of Corn in Bushels per Acre.	Yield of Stalks in Pounds per Acre.
1	No Fertilizer	3.4	680
2	100 lbs. Cottonseed Meal	4.6	860
3	200 Cottonseed Meal	8.6	1180
4	50 Dried Blood	6.9	1080
5	100 Dried Blood	7.0	1100
6	200 Cotton Seed	10.6	1120
7	400 Cotton Seed	10.3	1200
8	600 Cotton Seed	10.9	1060
9	No Fertilizer	8.0	920
10	100 Acid Phosphate	10.6	1100
11	28 Cottonseed Meal 43 Acid Phosphate	8.6	1040
12	14 Cottonseed Meal 86 Acid Phosphate	12.6	1140
13	56 Cottonseed Meal 139 Acid Phosphate	10.3	1300
14	72 Cottonseed Meal 172 Acid Phosphate	8.8	1280
15	86 Cottonseed Meal 215 Acid Phosdhate	9.1	1140
16	100 Cottonseed Meal 258 Acid Phosphate	4.6	1400
17	114 Cottonseed Meal 300 Acid Phosphate	4.8	1660
18	143 Cottonseed Meal 396 Acid Phosphate	5.7	1700
19	No Fertilizer	3 4	840
20	50 Kainit	3.4	860
21	29 Cottonseed Meal 43 Acid Phosphate 17 Kainit	8.0	1280
22	43 Cottonseed Meal 86 Acid Phosphate 33 Kainit	9.4	1420
23	57 Cottonseed Meal 129 Acid Phosphate 50 Kainit	10.8	1240
24	57 Cottonseed Meal 300 Acid Phosphate 60 Kainit	10.6	1720
25	57 Cottonseed Meal 33 Kainit	4.6	920
26	114 Cottonseed Meal 66 Kainit	4.8	1000
27	43 Acid Phosphate 17 Kainit	4.3	820
28	86 Acid Phosphate 33 Kainit	9.7	900
29	172 Acid Phasphate 66 Kainit	9.4	1080
30	258 Acid Phosphate 100 Kainit	10.3	980

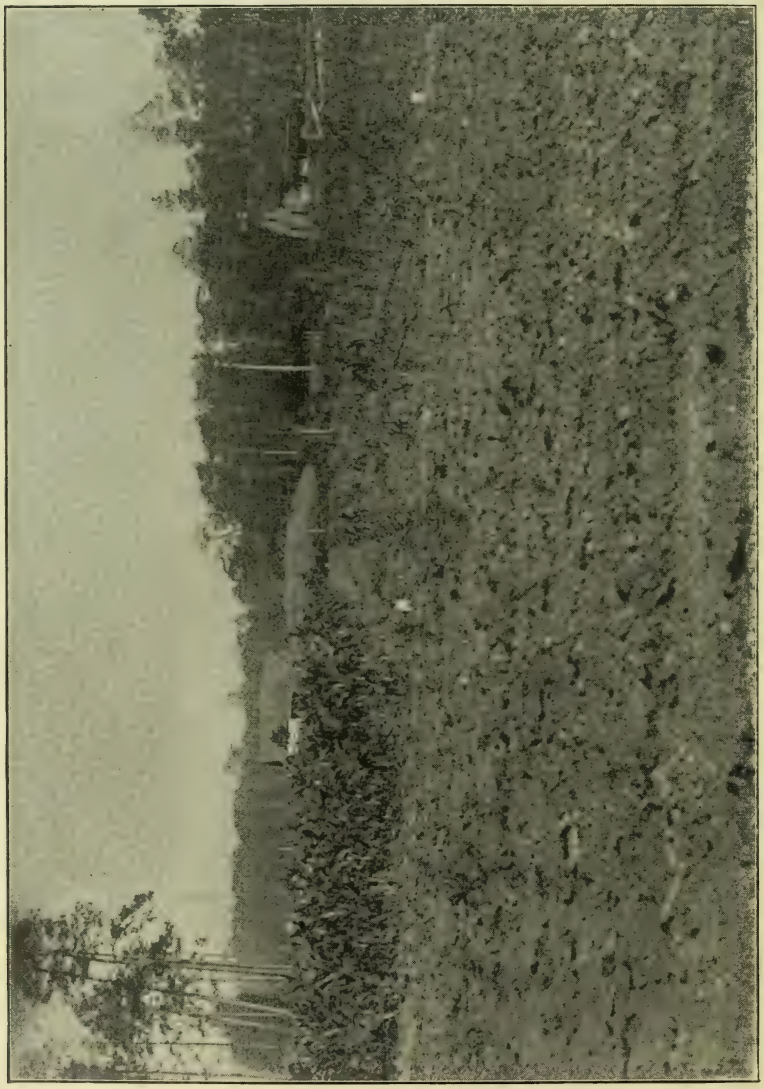


FIGURE 10.—FERTILIZER TESTS WITH CORN—MAY, 1902.

Remarks.—These results give little indication of what the land will do under normal conditions.

The corn was planted on land just cleared of trees and stumps and in poor condition for any crop. The planting was entirely too late even for ordinary seasons.

Our records show that from the twenty-second of May until the thirteenth of July we did not have enough rain at any time to settle the dust and that this period was remarkable for its drying winds. The results indicate the need of Phosphoric Acid on these lands and if they teach anything else, it is that the average farmer's method of putting only small quantities of fertilizers on his land (100 lbs. to 300 lbs. per acre) is probably the wisest and safest plan under the average conditions—though when these amounts are calculated down to pounds of Nitrogen, Potash and Phosphoric Acid, they seem absurdly small.

Two hundred pounds per acre of the average complete fertilizer sold in this State, would only mean 3.3 pounds of Nitrogen, 17 pounds of Phosphoric Acid and 4 pounds of Potash.

Somewhat at variance with the work of many expriment stations, the most of our field tests with fertilizers were made with very small quantities of the different materials furnishing the elements of plant food. On corn small amounts not only cost less, but gave larger returns in crop, due, of course, to the drought which caught the more highly fertilized plats further advanced in growth when they required more water for support than those of less vigorous growth. It seems almost incredible that three, four or even seventeen pounds of any substance distributed over 43,560 square feet of surface or among three million pounds of soil should in any way affect the yield of this soil. The average amount used in this State would be little if any more than 200 pounds per acre of some cotton or corn fertilizer and yet the yields are frequently doubled thereby. There are other things besides actual plant food in the commonly accepted term, that soils have to furnish crops, chief of which is moisture and when it can only furnish water enough at the crucial time to mature 20 bushels of corn, it is unwise to put enough plant food for fifty.

Hence it is that the more highly developed a soil becomes the more water it will hold, and, consequently, the more fertilizer we may apply with profit.

Test of varieties.—On April 25th, twelve varieties of corn

were planted on one-tenth acre plats all of which came up to a perfect stand and grew off nicely. It was fertilized with acid phosphate and cottonseed meal at the rate of 150 pounds of each per acre.

This corn received its last rain of any consequence on the 22nd of May and by the 13th of July when another came, the earlier maturing varieties, such as Blounts Prolific, Champion Early, White Pearl, Southern Snow Flake and Early Yellow Leaming were almost completely burned up. Mosby was the last corn to mature and thus was improved by the frequent showers after the middle of July.

The results may not show the same relative yields of the varieties as would be obtained a seasonable year and on land somewhat longer in cultivation.

The following table gives a list of the varieties and total amount of grain and stalks per acre :

VARIETY	Corn in Bushels Per Acre.	Stalks in Pounds Per Acre.
Mosby's Prolific	11.3	2040
Marlborough's Prolific	6.4	1785
Blount's Prolific	1.6	1525
N. C. White Prolific	8.2	1615
Cham. Early White Pearl	2.3	904
Southern White Snow Flake	2.9	1017
Hanna White	5.0	1717
Hickory King	6.9	1243
Conscience	5.6	1417
Tatum's Choice	10.2	1672
Early Yellow Leaming	3 7	960
Evans	7.6	1356

Cotton (*Fertilizer test*)—The fertilizer tests with corn were repeated with cotton. Thirty plats, each seventeen and one-half by one hundred and twenty-four and one-half feet, containing one-twentieth of an acre, were laid off in rows three and one-half feet apart and fertilized in various ways. Plats with no fertilizer on them were distributed among the others at regular intervals. On the eighteenth of April all the plats were planted with King's Improved Cotton seed which came up to a perfect stand. This cotton was cultivated regularly, and immediately after every rain, to maintain a good dust mulch. The results of this experiment are given in detail in the

two tables following and show most clearly the very great importance of acid phosphate on these soils.

Plats 7, 8, 9 and 10 are higher than they should have been, due to the fact that a small amount of stable manure had been thrown on this particular part of the field during the previous winter.

This was not known when the crop was planted, but the marked difference in the looks of the cotton on the four plats caused us to inquire for a reason.

The manure had only touched the ends of the rows as was plainly seen at a casual glance.

In our fertilizer tests with both corn and cotton we have taken very small quantities of Nitrogen, Phosphoric Acid and Potash as a unit application per acre—two pounds of Nitrogen, six pounds of Phosphoric Acid and two pounds of Potash, being the amounts used. They are furnished respectively by 28.6 pounds of cottonseed meal, 43 pounds of acid phosphate and 16.6 pounds of kanit. Hence the quantities of each of these three materials were applied, as near as possible, in some easy multiple of these amounts. This may best be illustrated by taking plats 21 and 23 as examples. In the former we use one dose each of Nitrogen, Phosphoric Acid and Potash, or at the rate of 2, 6 and 2 pounds respectively per acre; while in the latter we use two doses of Nitrogen, three doses or Phosphoric Acid and three doses of Potash, or four, eighteen and six pounds per acre.

In the experiments with these two crops we did not take into account the amount of Phosphoric Acid and Potash that the cottonseed meal contained.

In the second of the two tables following will be found the number of pounds of seed cotton per acre made with each application of fertilizer, its value, and the cost of the fertilizer.

In the table, acid phosphate has been rated at $13.50, cottonseed meal at $25.00, and cottonseed $20.00, dried blood, $50.00, and kanit $14.00 a ton. These are the prices paid for the above materials delivered at our station. The average yield of the four unfertilized plats has been used to calculate the increase of crops and net profit due to the use of each particular combination of fertilizers:

RESULTS WITH FERTILIZERS UNDER COTTON.

No. of Plat.	AMOUNT OF FERTILIZER CALCULATED IN POUNDS PER ACRE.	Yield of Seed Cotton in Pounds Per Plat. August 20th.	September 12th.	October 18th.	November 12th.	Total.	Total Calculated Per Acre.
1	No Fertilizer	2	4	10	10	26	520
2	100 Cottonseed Meal	3	8	12	11	34	680
3	200 Cottonseed Meal	2½	7¼	13½	10	33¼	665
4	50 Dried Blood	4	8	13	10	35	700
5	100 Dried Blood	4	7	12½	12	35½	710
6	100 Cotton Seed	1½	2½	10½	11	25½	510
7	200 Cotton Seed	3½	7½	14	15	40	800
8	300 Cottonseed Meal 300 Acid Phosphate	21	6	23	18	68	1360
9	No Fertilizer	5	7½	11	12	35½	710
10	100 Acid Phosphate	12	9	16	14	51	1020
11	28.6 Cottonseed Meal 43 Acid Phosphate	6	7	9	9	31	620
12	14.3 Cottonseed Meal 86 Acid Phosphate	8¾	10	12	10	40¾	815
13	57.2 Cottonseed Meal 129 Acid Phosphate	14	13	14	12	53	1060
14	71.6 Cottonseed Meal 172 Acid Phosphate	12½	14	13	11	50½	1010
15	85.8 Cottonseed Meal 215 Acid Phosphate	16	12	15½	13	56½	1130
16	100 Cottonseed Meal 258 Acid Phosphate	15	8½	15	12	50½	1010
17	114.4 Cottonseed Meal 300 Acid Phosphate	17	7	18	14	56	1120
18	143 Cottonseed Meal 386 Acid Phosphate	18	6¼	17½	13	54¾	1095
19	No Fertilizer	3¼	3¼	7	7	20½	410
20	50 Kainit	5¼	5¼	9½	10	30	600
21	28.6 Cottonseed Meal 43 Acid Phosphate 16.6 Kainit	9	8½	13	8	38½	770
22	43 Cottonseed Meal 86 Acid Phosphate 33.2 Kainit	12½	9½	13	11	46	920
23	57.2 Cottonseed Meal 129 Acid Phosphate 49.8 Kainit	15½	9½	17	12	54	1080
24	57.2 Cottonseed Meal 300 Acid Phosphate 49.8 Kainit	16¾	8	18	12	54¾	1095
25	57.2 Cottonseed Meal 33.2 Kainit	4	3½	9½	6	23	460
26	114.4 Cottonseed Meal 66.4 Kainit	6	3¾	11	7	27¾	555
27	43 Acid Phosphate 16.6 Kainit	9	6¾	11	8	34¾	695
28	86 Acid Phosphate 33.2 Kainit	12	8	10½	8	38½	770
29	o Fertilizer t	3	2½	6	7	18½	370
30	258 Acid Phosphae 100 Kainit	13	8	13	12	46	920

SHOWING FINANCIAL RESULTS FROM THE USE OF FERTILIZERS.

No. of Plat.	AMOUNT OF FERTILIZER PER ACRE	Pounds of Seed Cotton Per Acre.	Value of Seed Cotton at 2¾c Per Pound.	Cost of Fertilizer Per Acre.	Gain Per Acre over No Fertilizer. Lbs.	Value of Increase at 2¾c per Pound.	Net Profit From Use of Fertilizer.
1	No Fertilizer	520	14.30	00	00	00	00
2	100 Cottonseed Meal	680	18.70	1.25	178	4.89	3.64
3	200 Cottonseed Meal	665	18.29	2.50	163	4.48	2.85
4	50 Dried Blood	700	19.25	1.25	198	5.44	4.19
5	100 Dried Blood	710	19.52	2.50	208	5.72	3.22
6	100 Cotton Seed	510	14.02	1.00	8	.22	—.78
7	200 Cotton Seed	800	22.00	2.00	298	8.19	6.19
8	300 Cottonseed Meal 300 Acid Phosphate	1360	37.40	5.77	858	23.59	17.82
9	No Fertilizer	710	19.52	00	00	00	00
10	100 Acid Phosphate	1020	28.05	.67	518	14.24	13.57
11	28.6 Cottonseed Meal 43 Acid Phosphate	620	17.05	.65	118	3.24	2.59
12	14.3 Cottonseed Meal 86 Acid Phosphate	815	20.41	.76	313	8.61	7.85
13	57.2 Cottonseed Meal 129 Acid Phosphate	1060	29.15	1.58	558	15.34	13.76
14	71.6 Cottonseed Meal 172 Acid Phosphate	1010	27.77	2.05	508	13.97	11.92
15	85.8 Cottonseed Meal 215 Acid Phosphate	1130	31.07	2.52	628	17.27	14.75
16	100 Cottonseed Meal 258 Acid Phosphate	1010	27.77	2.99	508	13.97	10.98
17	114.4 Cottonseed Meal 300 Acid Phosphate	1120	30.80	3.35	618	16.99	13.64
18	143 Cottonseed Meal 386 Acid Phosphate	1095	30.11	4.37	593	16.30	11.93
19	No Fertilizer	410	11.27	00	00	00	00
20	50 Kainit	600	16.50	.35	98	2.69	2.34
21	28.6 Cottonseed Meal 43 Acid Phosphate 16.6 Kainit	770	21.17	.77	268	7.37	6.60
22	43 Cottonseed Meal 86 Acid Phosphate 33.2 Kainit	920	25.30	1.35	418	11.49	10.14
23	57.2 Cottonseed Meal 129 Acid Phosphate 49.8 Kainit	1080	29.70	1.93	578	15.89	13.96
24	57.2 Cottonseed Meal 300 Acid Phosphate 49.8 Kainit	1095	30.11	3.09	593	16.30	13.21
25	57 2 Cottonseed Meal 33.2 Kainit	460	12.65	.94	—42	—1.15	—2.09
26	114.4 Cottonseed Meal 66.4 Kainit	555	15.26	1.87	53	1.45	—.42
27	43 Acid Phosphate 16.6 Kainit	695	19.11	.40	193	5.30	4.90
28	86 Acid Phosphate 33.2 Kainit	770	21.17	.81	268	7.37	6.56
29	No Fertilizer	370	10.17	00	00	00	00
30	258 Acid Phosphate 100 Kainit	920	25.30	2.44	418	11.49	9.05

Test of varieties.—On April 19th, thirteen varieties of cotton were planted on land recently cleared, and all was fertilized at the rate of two hundred pounds acid phosphate and one hundred pounds cottonseed meal per acre. Owing to the irregularities in the contour of the land available for planting, all the plats could not conveniently be made of the same size. The first seven varieties in the table following were planted in one-twentieth acre plats, the next one, in one-fortieth acre plat, while the last five were planted on plats containing one-nineteenth of an acre. This cotton was worked exactly as was that on which fertilizers were tested and suffered alike for rain.

An effort was made to determine the percentage of seed and lint in each variety, but the results obtained at the gin were not accurate and are not published.

Besides the thirteen varieties appearing below in the table, one-half acre was planted, on April 28th, with Green's Gayosa cotton seed. This came up to a very poor stand, due to a slight dry spell and the abundance of trash on the land; it did not average two-thirds of a perfect stand. The plat was fertilized at the same rate as the other varieties and there was gathered a total of 334 1-2 pounds of seed cotton from the plat, a yield equal to 669 pounds per acre.

Size of Plat.	NAME OF VARIETY.	1st Picking Aug. 12th.	2nd Picking Sept. 13th.	3rd Picking Oct. 16th.	4th Picking Nov. 12th.	Total Seed Cotton in Pounds.	Yield Per Acre.
1-20a	Russell's Big Boll	8½	9	12	12	41½	830
1-20a	Strickland	8½	8½	12	11	40	800
1-20a	New Century	10	6	9	7	32	640
1-20a	Lewis's Prize	9½	9	11	9	38½	770
1-20a	Robey's Prolific	9	7	13	11	40	800
1-20a	Cameron's Early	7	10½	14	10	41½	830
1-20a	Drake's Cluster	8	8¼	13¼	11	41	820
1-40a	Texas Bur	4¼	4¼	7	8	23½	940
1-19a	King's Improved	15½	11½	18	16	61	1159
1-19a	Peterkin	9	11	18	12	50	950
1-19a	Davis's Long Staple	6¼	11¼	15½	9	42	798
1-19a	Doughty's Long Staple	4½	12	16½	12	45	855
1-19a	Griffin's Long Staple	5	7¼	13	11	36¼	689

Weather.—All of the cotton was very seriously injured by the pratracted drought, and for this reason the fertilizers had poorer opportunity to show their actual benefit.

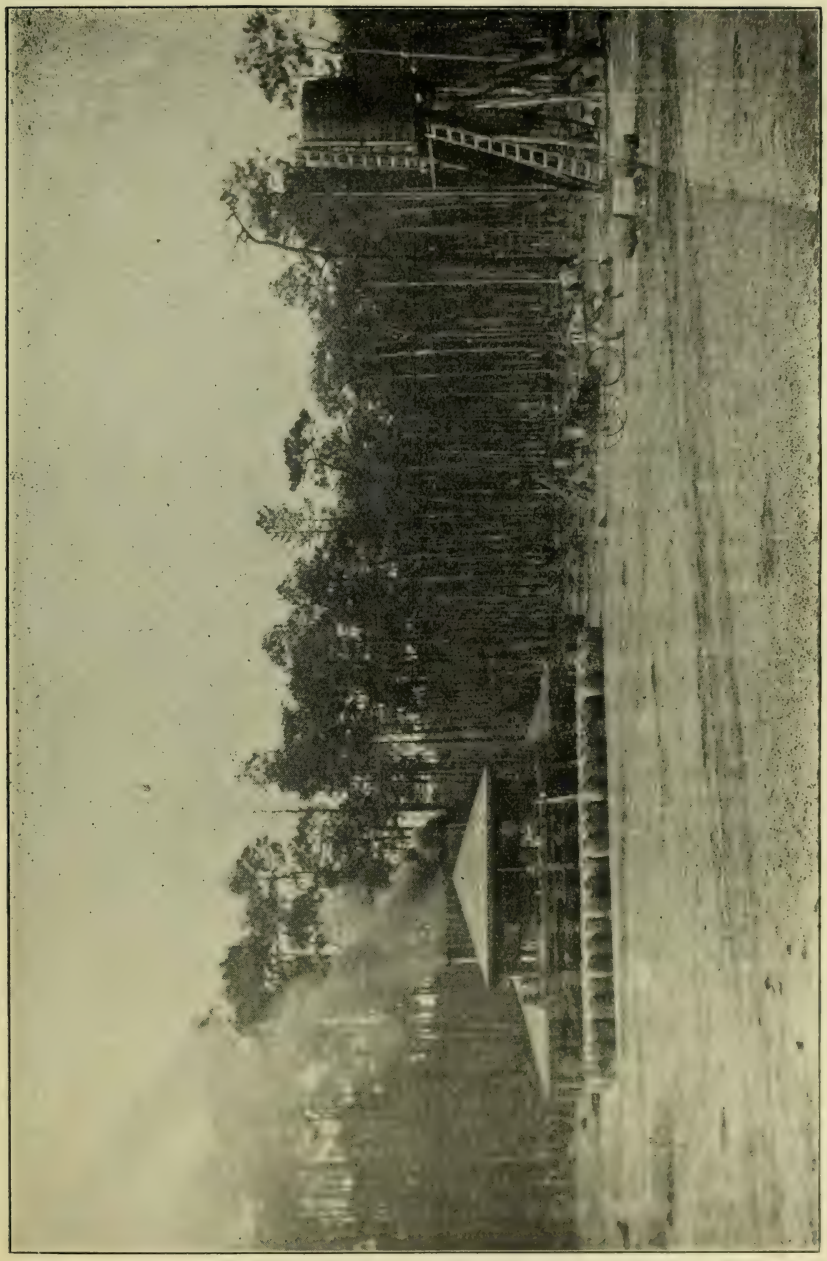


FIGURE 11.—TURPENTINE STILL. (Courtesy U. S. Beaureau of Soils.)

At the end of the drought, the crop had stopped growing and fruiting almost entirely, and what unmatured bolls had formed, were shed when the rains began.

The squares set after the middle of August, forming the top crop, gave considerably over one-half the yield. A late frost gave good opportunity for prolonged fruiting and maturing.

MISCELLANEOUS CROPS.

Chufas.—Three varieties of chufas that had been cultivated in Spain the year before were planted on April 23rd, in rows two and one-half feet apart. They were fertilized at the rate of two hundred pounds each of acid phosphate and cottonseed meal per acre. The seed were soaked two and one-half days and dropped fifteen inches apart in the drills.

They came up to a fair stand and gave the following yields per acre as near as could be gotten in gathering them, which is a slow and laborious process. The results are calculated per acre, as only small amounts of each variety were planted.

No. 8216, Chufurar Alborayar—2565 pounds per acre.
No. 8217, Chufurar Balasaur—2576 pounds per acre.
No. 8218, Chufurar Algenese—2257 pounds per acre.

This is emphatically a crop for hogs as every person will learn who attempts to gather them by hand. Our soils seem to suit them to perfection and but for the injury from drought they would have given much larger returns.

Sweet potatoes.—Four bushels of what is locally known as "Davis Yam" potatoes were bedded on April 29th, and from the slips or draws one acre was planted in sweet potatoes. They were all fertilized with 150 pounds acid phosphate and 150 pounds cottonseed meal per acre, and in addition to these the last fourteen rows received kainit in like proportion, 150 pounds per acre. We began setting out slips on May 15th, and finished the patch on June 21st.

The potatoes were dug a little early in order to feed steers on the land. We commenced to dig them on October 23rd, and selected four typical rows from each plat to get results showing the effect of the

two methods of fertilizing, as it was not convenient to weigh the entire product of each plat.

The four rows having only acid phosphate and cottonseed meal produced at the rate of 151.3 bushels of merchantable and 13.5 bushels of seed potatoes, while those that received Potash in addition to these two only made 84 bushels of merchantable and 13 bushels of seed potatoes per acre. Again we cannot account for the seeming ill effect of potash. The soils were exactly similar, and except for having been planted probably two weeks later the two plats had precisely the same treatment.

Spanish peanuts.—On the 26th, of May we planted practically one-half acre in Spanish peanuts. The land was rather rough and too full of trash to make any thing like a good seed bed. One-half of the patch was fertilized at the rate of 150 pounds of acid phosphate and 150 pounds cottonseed meal per acre, the other half receiving only 150 pounds of acid phosphate. The nuts were soaked for two days and planted without shelling.

No apparent difference could be detected with the eye between the plats fertilized with and without cottonseed meal.

They were all pulled up on October 27th, the nuts pulled off the vines and weighed after drying several days.

The eight rows having meal in addition to the acid phosphate made at the rate of 956 pounds of nuts per acre, while the eight rows with acid phosphate alone made at the rate of 844 pounds per acre.

Practically all the nuts were pulled up with the vines.

While we had no means of weighing it some very fine hay was saved from these vines which the stock ate with relish.

Sorghum.—On May 26th, about two acres were laid off in three foot rows, fertilized with 130 pounds each of acid phosphate and cottonseed meal per acre and planted in sorghum for forage. This yielded two heavy crops, the second one of which was fed to fattening cattle.

Here again the lack of suitable scales prevented our getting the data wanted.

Cow-peas.—Fully twenty-five acres, including those grown after corn, were planted in cow-peas.

Four or five acres of the earliest plantings were, without doubt,

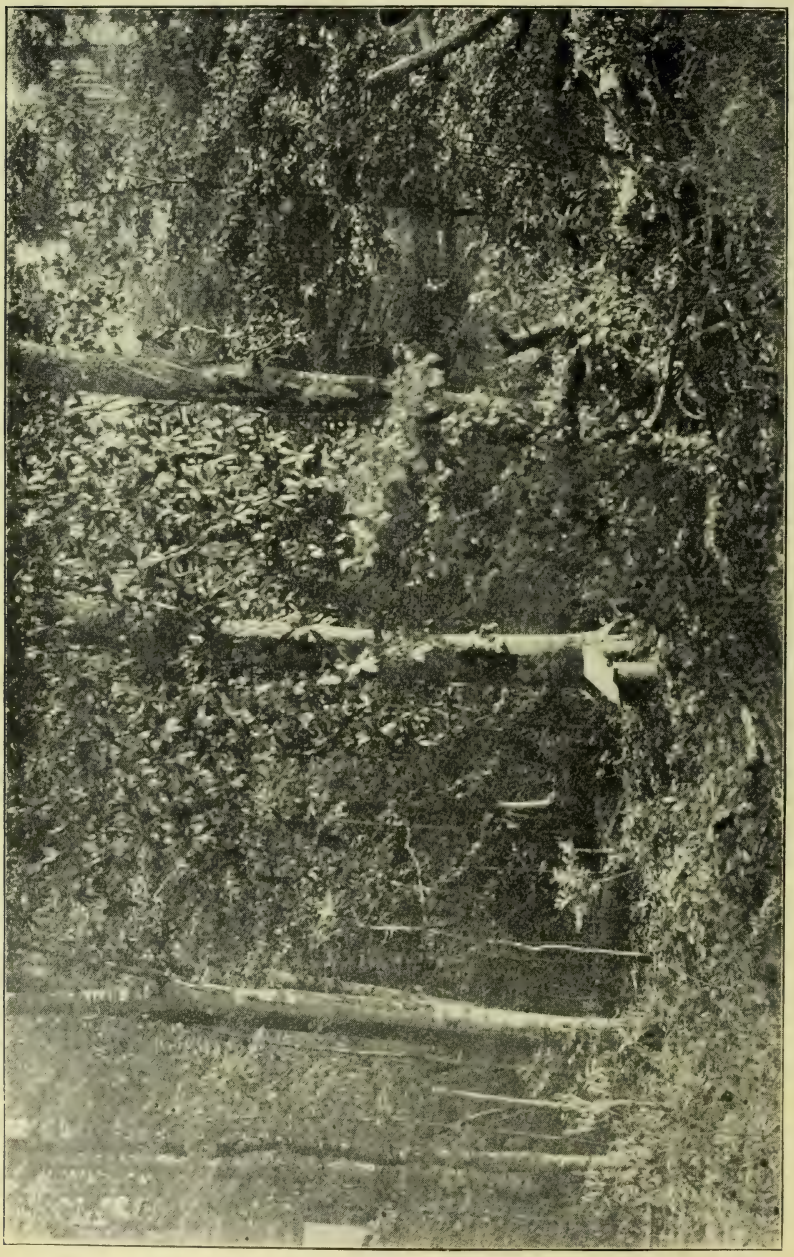


FIGURE 12.—BAY GALE.

the finest peas we have ever seen grow. We regret exceedingly that the yields could not be recorded.

Those planted later were of a different variety and though they fruited heavily, the vines did not attain a very large size.

On all this second planting of about twenty acres, we picked a crop of peas before cutting the vines for hay.

The great abundance of sticks and knots left after clearing necessarily caused us to leave a large per cent. of this hay on the ground,

FIGURE 13.—STATION BARN.

fearing to cut too close and being unable to rake and haul it to good advantage.

Fall Irish potatoes.—On the 18th of August two and one-half bushels of Irish potatoes were planted on one-fifth acre of ground.

They were fertilized at the rate of 300 pounds of acid phosphate and 300 pounds of cottonseed meal per acre, in rows two and one-half feet apart. The weather being dry the potatoes were covered deep and afterwards blocked off.

They were planted in two different portions of the place owing to a sufficient space for them all together. Strange to say those planted north of the house came up fairly well; those south of it scarcely at all. Several rows were planted with potatoes cut and several with whole potatoes and no difference could be detected in the way they came up.

The ones north the house had about one-half of a perfect stand and when dug on November 20th gave 267 pounds of potatoes on the one-twelfth acre, or at the rate of 54 bushels to the acre.

Strawberries.—Soon after reaching McNeill, on April 3rd, 54 varieties of strawberries of 25 plants each were put out. The land was so full of trash and the weather so dry that the most of these plants died. So few lived that in the fall new plants were put out entirely of all these varieties and enough additional ones to make 114 now under test. Tests have been started to find out the fertilizer requirements of this crop and two acres planted to show the commercial side of growing and shipping them.

Asparagus.—On April 3rd, 1200 asparagus roots were put out in rows four and one-half feet apart. There were enough plants to set seven rows 267 feet long. This asparagus has done remarkably well and bids fair to be a profitable crop.

Tomatoes and egg plants.—A few plants each of these two vegetables were gotten from the College and planted very late in the season. The length of the time required to get them here and the drought following this planting caused a good many of each to die. The ones that lived fruited well.

Cabbage.—Four thousand cabbage plants were put out on October 1st, nearly all of which lived.

They were attacked by cut worms early in their growth and though several attempts were made to destroy these pests, they continued to cut the plants.

They bite off the cabbage at or just beneath the surface.

The plants yet remaining are doing well and show evident signs of making first class heads.

Grasses and Clovers.—In the Fall, forty-four kinds of vetches, clovers and grasses were planted in small plats ten by fifteen feet, to find the ones best suited to these soils. Several plats of such

crops as alfalfa, red clover, hairy vetch, and rape were planted to test different ways of treating these crops so as to give them the best growth. A stand was secured on most of the plats and they are doing well at this time. Three-fourths of an acre each of oats and wheat were also planted in the fall and both are doing well.

Rotation experiments.—It has been planned to set aside four plats of one-half acre each for rotation experiments.

These plats are each divided into two portions of one-fourth acre each, one of which will be fertilized each year while the other will not. Three of these half-acre plats will be rotated in corn, cotton, oats and cow-peas. The fourth plat will each year be planted in cotton. This experiment was begun in the fall by planting oats on the one-half acre assigned them.

Fruit trees.—During the month of December 436 trees of various kinds were put out. These included some of the most promising varieties of each fruit named. Two trees of each variety were used. This list includes 36 kinds of apples, 36 of peaches, 17 of plums, 14 of pears, 8 of pecans, 4 of figs and three of mulberries. One hundred trees each of Elberta and Greensboro peaches were put out, one-half of which will be used to test the fertilizer requirements of orchard crops, while the other half will be purely a commercial orchard.

Eight varieties of grapes of two plants each have been put out and if they succeed will be the beginning of a larger vineyard later.

Mississippi Agricultural Experiment Station.

BULLETIN No. 80.

FARMERS' INSTITUTE BULLETIN, 1902.

DAIRY BUILDING.

AGRICULTURAL COLLEGE, MISS.

MARCH, 1903.

MISSISSIPPI STATIONERY CO., YAZOO CITY.

SCIENCE BUILDING. DORMITORY. ACADEMIC BUILDING.

FARMERS' INSTITUTE BULLETIN, 1902.

Indroduction.—At the close of the institute season a round-up farmers' institute was held at the college the latter part of August 1902. Summaries of the addresses presented at this meeting are published in this bulletin. As funds were not available for the purpose, a full report of the proceedings could not be published. The committee, to whom was entrusted the work of condensing the papers, made an effort to retain as much of the language of the speakers as possible as well as all of the information which they sought to convey.

Prior to 1897, only a few institutes had been held in the State, but since that time the number has increased each season. The total attendance at these meetings has increased from two hundred to ten thousand. At the last session of the Legislature $3,000 were appropriated for defraying the expenses of farmers institutes for two years.

WELCOME ADDRESS.

Professor J. C. Hardy, President of the Mississippi A. & M. College, in welcoming those in attendance at the college spoke as follows:

It affords me pleasure, ladies and gentlemen to welcome you all to this institution, your institution, to the buildings and the grounds. It is the peoples' college and, therefore, I bid you welcome to your own. I am glad you are here as are, also, the authorities of the college, and we hope that when you shall have returned to your homes that you will feel that your visit here was both pleasant and profitable.

I believe that this is the beginning of a great movement. I have no doubt but that ideas will be presented that when they shall have reached every neighborhood and farm in the State will bring life and gladness where now is darkness and grief. We have with us not only the best agricultural thought in Mississippi but some of

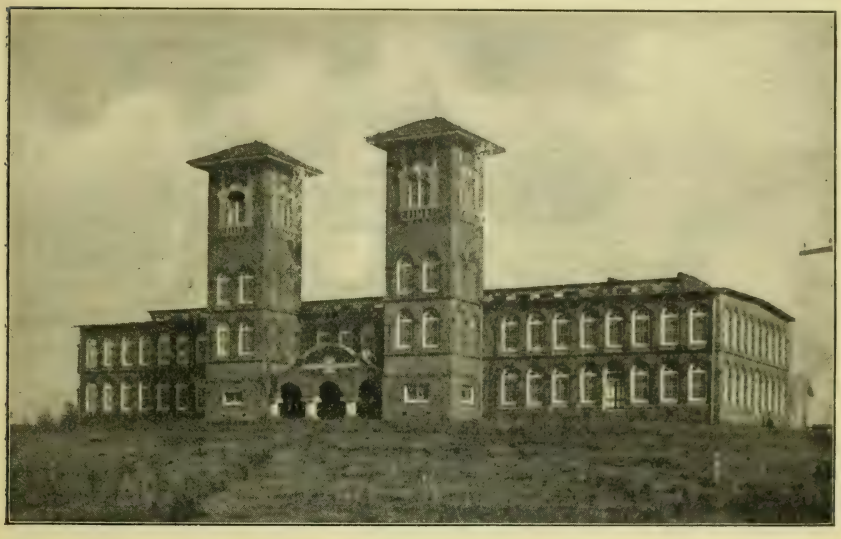
the best in the United States. The people and farmers of Mississippi are entitled to the very best. We should bring to this meeting the best thought of the State and the entire country in order that you may take it back with you and incarnate it in the management of your own affairs where its influence will spread until it reaches every industry in the commonwealth.

I would be delighted of course were this hall full of people from every county in the State. It would be better but I am in no way discouraged for the attendance is as large as I expected. You who are here will get the more attention and will, therefore, get the more benefit. We have with us especially one speaker who says she does the best work when she is speaking to small audiences.

We have met together for the purpose of exchanging ideas concerning agricultural matters that we may become familiar with the principles on which is based the great business of farming. In future this meeting will be called a Farmers Institute and Industrial Convention because this college stands not only for agriculture but for every industry that tends to develop our vast resources. I hope to see at these meetings the farmer and the manufacturer as well as others interested in our industrial development. The great importance of agriculture is fully appreciated but it can never bring true prosperity without having connected with it other industries. If everyone was engaged in agriculture no one could be truly prosperous. Agriculture is the basis of all other industries but it also depends on all others, and while this may appear contradictory, yet it is true. A rabbit cannot go up the outside of a tree—it must have something against which to brace itself, and so agriculture without other industries against which to brace itself is in a collapsed state.

Twenty years ago land in Spartenburg County, S. C., was worth $2.50 an acre. The same land now sells for $50.00-$100.00 an acre. There are now 28 cotton mills in that county, giving employment to 15,000 people. Besides cotton the farmers now have fruits, vegetables, milk, butter, etc., for sale. The mill operatives must buy the things they consume. Here we see agriculture braced against the manufactures of the county. We do not want a surplus population of loafers living off of the agricultural population for "they toil not neither do they spin" and yet they go between the setting and the rising of the sun and feed off of the man who toils. We want a people who are able to buy the things the farmer raises thus enabling him to diversify his crops and find a ready market for what he

produces. A prosperous manufacturing community will give us a prosperous agricultural community. The prosperity of each class is interdependent upon the other. There must be unity and harmony



TEXTIILE BUILDING.

between all classes of our people. Again I bid you welcome to this meeting whose influence I hope will spread throughout the entire State.

THE RELATION OF THE EXPERIMENT STATION TO MISSISSIPPI FARMERS.

Prof. W. L. Hutchinson, Director of the Mississippi Experiment Station, said that the agricultural experiment stations in this country were established to help farmers by giving reliable information concerning agriculture. Every farmer must operate his own farm and succeed or fail according to his ability. The only help you can give him is reliable information as to matters of fact that his judgment may be good and his practices correct.

Though their work has been retarded by many difficulties, which farmers and others fail to appreciate or to understand, still the stations are a success and they are fulfilling their mission in a manner and to a degree that, perhaps, is greater than was expected. They have done research work in almost every field of agriculture and have usually furnished some information regarding every subject investigated.

The speaker said that the Mississippi experiment station was established in 1888. It is one of the smallest stations in the country not having received any support except from the United States Government. The results of the work of this station have been printed in 77 bulletins and 15 reports. Among other things, the investigations of this station have included a study of soil fertility and the improvement of worn soils; grasses and forage plants; feeding and the relative values of feeds; the value of cotton seed to the farmer; the production of mutton, beef, and milk; Texas fever and other diseases of live stock; orchard crops and small fruits; injurious insects and spraying; cotton, corn, wheat, and oats.

But farmers have not been in a position to profit as much from the work of the stations as they might have done. Before the establishment of the stations, farmers had acquired a deep and possibly not altogether unwarranted prejudice against book farming. Farming operations should be based on something better than mere opinion and untried theories. Before farmers can derive full benefit from the work of the stations they will have to conquer their prejudices in regard to all printed matter concerning agriculture, and more than this, they must acquaint themselves, by reading and otherwise, with the results obtained by experiments and research. It is clearly impossible for the farmer to profit by the experience and work of others when he does not know anything of the results obtained.

Every farmer constantly uses information which he has gotton from others. What a boy learns on his father's farm, if it be good he uses constantly on his own farm when he has one. One farmer may and often does learn something of value from other farmers; and the same careful, patient course of procedure in regard to the work of the experiment stations would meet with equally as good results. Simply reading a thing in a book, bulletin, or paper may not give that familiarity with it that is necessary to successful practice. If a farmer would know a thing well and also know that he knows it let him do it. In his first trial he need not and should

not utilize the entire resources of his farm, for one's first efforts are rarely so successful as subsequent ones. The first trial should be regarded as a part of the learning period instead of a bread-making or money-making operation. To illustrate: Let the farmer be told that it pays to subsoil land. Though he may remember that statement perfectly, it does not follow that he knows that it will pay him to subsoil his farm. The prudent farmer would not proceed to subsoil his entire farm, or even any considerable part of it, but would select a small plat of an acre or even half an acre and subsoil it at, perhaps an inappreciable cost, and wait for results. If the subsoiled plat failed to give an increased yield for five years he would be sure to decide not to subsoil his farm. It is not what other people know but what a farmer himself knows that should be the basis of all extensive operations. But if some one else knows something useful and helpful, the progressive farmer must try and know the same thing.

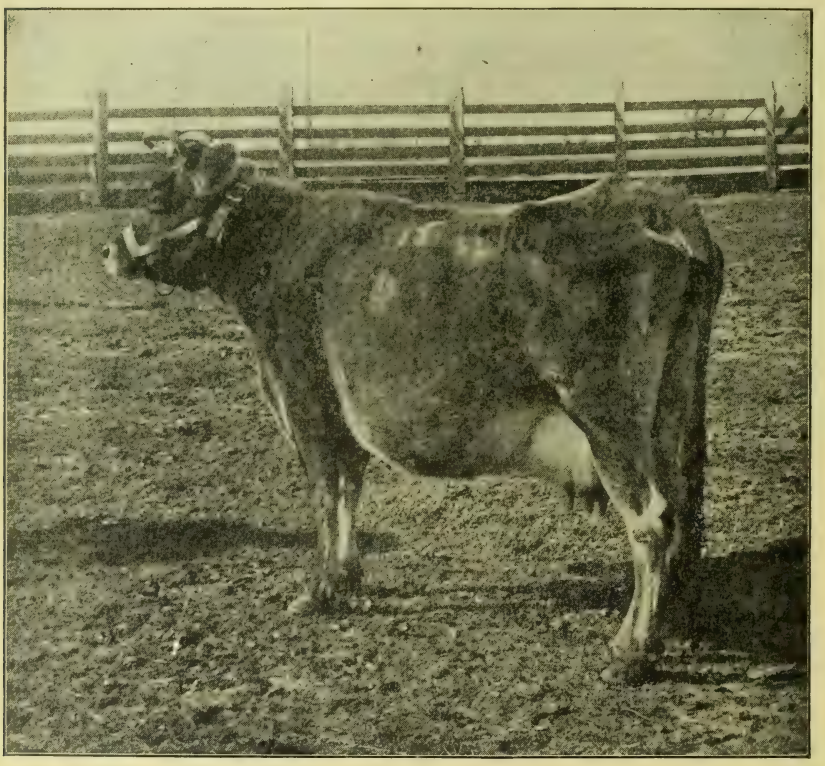
The stations are obtaining much useful information concerning agriculture and this information, printed in bulletins and reports, is making a valuable literature for farmers, which they should find some practical way of making their own. The bulletins of the station are sent free to all farmers who apply for them. Properly and judiciously used the bulletins of the stations should be an indispensable help to every farmer in the country.

ONE WAY TO DEVELOP A DAIRY COW.

Mrs. Ada F. Howie, of Wisconsin, by way of introduction said that if it were necessary for her to apologize for speaking on the above subject, she had only to point to the fact that women in every rank and condition in life—from the queen on the throne to the peasant of lowly birth and humble aspirations—had left an indelible imprint of their work and influence upon this noble calling.

She said that as early as 1734 an able historian had attributed the beauty and meritorious qualities of the breed of cattle found on the Island of Jersey to centuries of gentle care under the management of women. The entire secret of a remarkable record of successful breeding stands out strong and clear, that will remain unaffected by time or change. The women of this now famous Isle, instead of placing their affections upon an unremunerative parrot or

poodle, have expended their best energies upon the finest breed of dairy cattle in the world. In their devotion to this cause they have given more than gold and silver and precious jewels, they have poured out upon the alter of advancement the wealth of loving hearts and kindly natures. They have guarded their cattle with the tender impulse of a true friendship.



SHOWING DAIRY FORM.

We look back with a feeling of awe, not unmingled with envy, at the wondrous skill of breeders long since passed away and yet it is the old, old story handed down with accumulated experience from generation to generation, and all successful dairymen and women of

the present time may trace their prosperity to certain gentle methods that are but a part of a repetition of the means employed in bygone centuries. In order to attain eminence in any calling, one must not only apply the lessons learned from others but strive to profit by observation and personal experience as well. With this borne in mind and a love, either natural or acquired, combined with an earnest desire to excel in his chosen vocation, no breeder or dairyman need write in connection with his name the word failure, and the limit of his success may be bounded only by the extent of his energy and the amount of intelligence brought to bear upon the management of his stock.

The first step taken in the improvement of any breed should be to develop the confidence of an animal. In order to do this, one at all familiar with the rudiments of a breeder's knowledge, has but to run a finger down the index of a by-gone period until he comes to the magical words "centuries of gentle care," containing a manifold meaning—for wisdom, steadfast purpose, pride and affection, are all blended and condensed into those four expressive words—and then fall into line to do his duty to the best of his ability in the improvement of his cattle.

The dairy papers have chanted that refrain "gentle care—gentle care" week after week and year after year, and yet, from a number of cases easily found, it will bear a constant repetition, for it is the key note to the entire secret of dairying. A man may be endowed with skill, intelligence, perseverence, and there may be added that most convenient commodity, wealth, and yet, if the management of his stock the all-important requisite, gentle care, be lacking his efforts cannot but result in disaster of a more or less serious nature.

Some of the abandoned farms of the East and the hand to mouth existence of numerous Western farmers might doubtless be quoted as an eloquent sequel of a total disregard of this oft repeated admonition. Domestic animals are affected by surroundings in the same proportion as are human beings.

No matter how well born a person may be, if compelled to occupy from birth filthy quarters, with no opportunity or incentive for moral or intellectual improvement, such a person will in the course of a few years lose all semblance to aristocratic lineage. While on the other hand, if a child should be taken from the hovel of common place parents and put under refined and loving conditions, it would

not be unreasonable to expect a revolution out of all keeping with the slow strides of the natural progress of civilization.

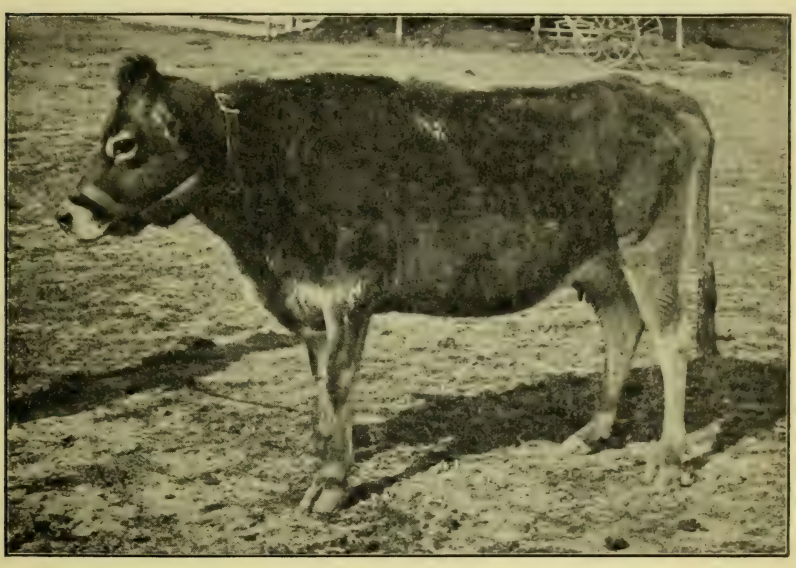
The speaker said that the same law would hold good when applied to the lower animals and asserted that it was the duty of every one to protect the animals under their care. To at least make an honest effort to develop every good quality possessed by the animal.

Clean, dry, and comfortable quarters should be provided for the dependent creature that will in a short time doubtless return ample recompense for all care and labor expended in her behalf. A few months of careful feeding and judicious exercise will begin to shape the little frame and from then on the practiced eye of an experienced breeder will enable him to form conclusions as the outline quickly develops into a more or less perfect type of his ideal standard. Here, the speaker said, she would like to caution those who chose as their motto: "Handsome is as handsome does," and who care little for symmetrical beauty, not to lay too much stress on the rules that govern the show ring. The disposition and the temperament of a dairy cow have quite as much to do with her ability to produce milk and cream as thin withers, dished face, and small incurving horns, and fashionable markings, and it would be well to make a study of these important characteristics.

She said that experience had taught her to believe that early breeding does not affect the growth of an animal, and while one should use his best efforts to secure symmetrical forms a far more weighty consideration than size or shape is the developing of the creaming and milking qualities of a dairy cow. In order to do this to the best advantage too great care cannot be exercised in the selection of food, for it would be unwise to impair the digestion by overfeeding or to allow her to live upon her vital forces through parsimony or heedlessness, to provide sufficient nourishment. There are herdsmen who believe that food—quantities of food—is the all essential stimulant to production. Regularity in feeding and watering, together with a daily grooming, may be considered quite as desirable factors in profitable dairying as a carefully balanced ration. A too liberal allowance of grain is harmful in the extreme. She said that she heartily agreed with a noted breeder who once remarked, that it was a good idea to mix your ration with one third enthusiasm. In addition, a large pinch of love, a generous measure of common sense, and an unlimited vocabulary of sentimental terms of endearment will

enable one to make a most creditable showing, even though his ration of the substantial elements is slightly below the standard.

To obtain the best results the every-day life of a cow should be reduced to a system bordering on utter monotony; she should go in



UNDESIRABLE TYPE.

and out at the same door, invariably occupy the same stall, should be fed, watered and milked at regular intervals. In short her entire existance should be as placid and uneventful as possible, for anything to disturb her sufficiently to cause an interruption of the peaceful occupation of cud-chewing will, to a greater or less degree, affect both the quality and the quantity of her product. There is one more essential point in building up a useful as well as an attractive herd of dairy cows that is too often overlooked, even by some of the most prominent breeders of fancy stock, and that is in shaping the udder. There is an old saying, "no foot, no horse," and dairy lore could as appropriately adopt one that would read, "no udder, no cow," for while there may be rare exceptions to a case in point of

useuflness, a cow with a defective or ill proportioned udder for a number of reasons should not be tolerated in a herd by one whose worthy ambition is for the improvement of the breed in which he is interested.

As the milker or herdsman has it largely in his power to either mar or mould this important feature of the dairy animal, there is little doubt that if taken at the proper time, by the exercise of care and judgment many an unsightly udder might be coaxed into a semblance closely approaching the highest standard. In case of the unevenly shaped udder of a heifer, it would be well to first draw the milk from the quarters best developed, for the reason that it would throw all the weight of the undrawn milk into the smaller quarters, thus helping to distend the inferior parts. A still further advantage would be gained by a daily half-hour's gentle rubbing of the undeveloped quarters, moistening the hands from time to time with a few drops of sweet oil.

A cow from the time of dropping her first calf on through life should be milked three times daily for a period extending from five weeks to as many months according to conditions directly after calving. She said that she had been told that this was the usual custom on most of the best dairy farms in England, Scotland, Germany and France, and other countries where profitable dairying has reached a point near the limit of possibility. A few years experience will prove the value of this practice, for, while it certainly assists materially in developing the milking qualities of a heifer, it is no less useful in enriching the quality and stimulating the flow of milk in an older cow.

In conclusion the speaker said:

"The above are the main points in the course I have endeavored to follow in my efforts to improve the cows of my herd, and I shall continue in this way until I am advised of a better method which, after a trial, should it prove superior to the one now in use, I shall adopt it at once. My career has not been one unbroken course of triumph. At times it has been marked by deep ruts of discouragement, and blocked by heavy crosses of disappointment. Still, although I am now far from my standard of achievement, I have demonstrated to my own satisfaction, that dairy farming conducted on business principles may be made not only one of the most delightful and interesting occupations, but a source of gratifying profit as well. While one is using his best efforts to enhance the beauty and worth of a creature that seldom fails to respond most generously to gentle care and intelligent management they are at the same time nobly expanding the best qualities of heart and brain and phys-

ical strength and their conscientious labor will meet with a speedy and cordial recognition."

THE FUNCTIONS OF LIVE STOCK ON THE FARM.

Prof. W. L. Hutchinson, Director of the Mississippi Experiment Station, said that the present system of farming in Mississippi is an unsatisfactory one, as it fails in a number of things that are of prime importance to successful agriculture. Under the present system of farming we have twenty million acres of land in the State that we do not know what to do with. All the land on the farm cannot be used profitably. The productiveness of the soil is not maintained and any system of farming that fails to keep the land productive must finally be abandoned.

The speaker said that the growing of live stock is not a feature of the present system of farming in this state and, perhaps our people could not do better than to consider earnestly the functions of live stock on the farm and what such an industry, as a feature of our farm operations, would mean to those engaged in the business.

The productiveness of the soil must be maintained or disaster is sure to follow. In many ways live stock tend to keep a farm productive. The plant food removed from the soil by forage crops may be returned to the land in the manure of the animals.

Live stock encourage the rotation of crops and diversified farming by furnishing a convenient and ready market for the crops grown. Such a rotation is perhaps an indispensible condition for keeping soils in a high state of productiveness. The cotton farmer does not and will not rotate his crops so that each piece of land will be in cowpeas or other restorative crops every three or four years. He argues that when his land is occupied by restorative crops he virtually loses the use of it and that he cannot afford the loss of one-third or one-fourth of his land each year. But if cotton farmers keep their land productive they must of necessity grow leguminous crops. Where live stock are raised on the farm restorative crops may be grown at a profit as extensively as may be desired.

The washing away of the surface soils on cotton farms is a thing so ruinous as to be intolerable if the farm is to be kept productive. Hence, grass is the most appropriate crop for such lands as tend to wash badly. Without live stock, the farmer has no use for grass and

cannot make grass lands profitable. Notwithstanding this fact, much of the most valuable land in the world is in grass.

With twenty million acres of land lying idle, much of it of a nature that would, if put in bermuda grass and lespedeza, make as fine pastures as could be found anywhere, we spend a large part of the proceeds of the cotton crop for live stock and live stock products produced by farmers elsewhere. The growth of live stock gives an opportunity to profitably employ all the labor on the farm at all seasons of the year. Where only cotton is grown there is at least one-third of the year when most of the labor cannot be profitably employed. Women and children do most of the work in cotton factories. The farm should offer an opportunity for such persons to be profitably employed at work best suited to them. Women do the most efficient dairy work. The profitable employment of all the labor on the farm is a very important matter and the growing of live stock adds greatly to the opportunity of doing this.

Manufacturing establishments derive their principal profits from the sale of skill. The farmer may sell skill as well as others and the more skill he sells the more profitable will he find his farm. The growth of live stock offers the farmer the very best opportunity for the profitable use of skill and knowledge. Cotton farming offers the most limited opportunity for the sale of skill.

Live stock furnish the best and most convenient means of marketing many farm crops and by-products. Without live stock, farmers in the corn and alfalfa sections could not market their crops. The cotton seed produced in Mississippi contain more than five million dollars worth of fertilizer material, all of which could be kept on the farm by feeding the meal and hulls to cattle. Perhaps no farmers in any other section would be so indifferent as are cotton farmers to the value of such by-products.

In the last fifty years our people have solved some very difficult problems but they still have to solve the problem of successful and profitable farming. The functions of live stock on the farm are so important that it would seem that any system of farming that did not include them could not exist and the absence of live stock from our present system appears to be responsible for many of the ills which now make the farming in this State unsatisfactory.

In conclusion the speaker said:

I will be pardoned for referring briefly to such stock as we have.

How few good animals are raised in the State. How little attention is given to this most important feature of farming. No effort made to breed the best animals of any breed or type. Only the cheapest and most indifferent sires are used anywhere. From the very nature of things our live stock must be approximately of the poorest possible quality for we see no care in breeding, no selection, no effort to improve or to have the best; no skill; no feeding or breeding ability—only neglect.

RAISING BEEF CATTLE FOR PROFIT IN MISSISSIPPI.

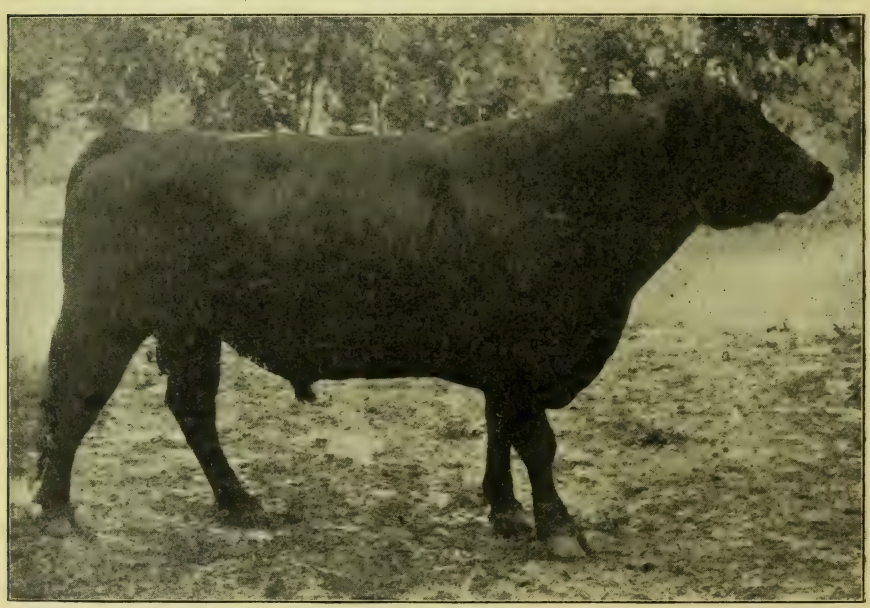
In discussing this subject Mr. E. R. Lloyd, Professor of Agriculture, Mississippi A. & M. College, spoke as follows:

The subject assigned me is one of growing importance to the State and to the South. We have, for many years grown too much cotton and too little grass, forage and live stock. Our system of farming must change for under the old system of cotton farming no cover or restorative crops were grown and with constant clean culture the land on many farms has become exhausted of humus to such an extent as to fail, even when fertilizers are used, to produce a profitable crop.

The farmers in the hill section of the state cannot compete with those in the Delta in growing cheap cotton even if they buy liberal amounts of fertilizer. Whether we produce one or two bales per acre the cost will be practically the same except the picking and ginning. Although cotton has been our principal crop for nearly a century there has been little progress made in reducing the cost of production except by increasing the yield. To increase the yield we must first increase the fertility of the soil. The introduction of live stock into our system of farming would, perhaps, offer the quickest as well as cheapest method of permanently improving our lands. This would necessitate a system of crop rotation to produce feed for the stock. Naturally we would grow many leguminous crops of which we have a large number suited to our soil and climate. Mention may be made of cowpeas, melilotus, lespedeza, red, white and burr clovers, velvet beans, hairy vetch, soja beans, and alfalfa. All these plants improve the soil.

With more live stock on the farm less money would be spent for fertilizers, and then, to secure the best results with fertilizers the soil should be well stored with humus. The average farmer requires a greater incentive for growing restorative crops than the mere im-

provement of his land and to get a little hay for the cow and work horses. A nice herd of beef cattle would doubtless furnish the needed incentive. Nearly every farmer to whom the question is asked: "Why do you not grow more restorative crops to improve your soil and lesson your expenditures for fertilizers?" replies "that we have no ready market in the State for such hays and we have no stock to eat it." Instead of buying so much fertilizer would it not be better to spend a part of the money, at least, for good bulls of the

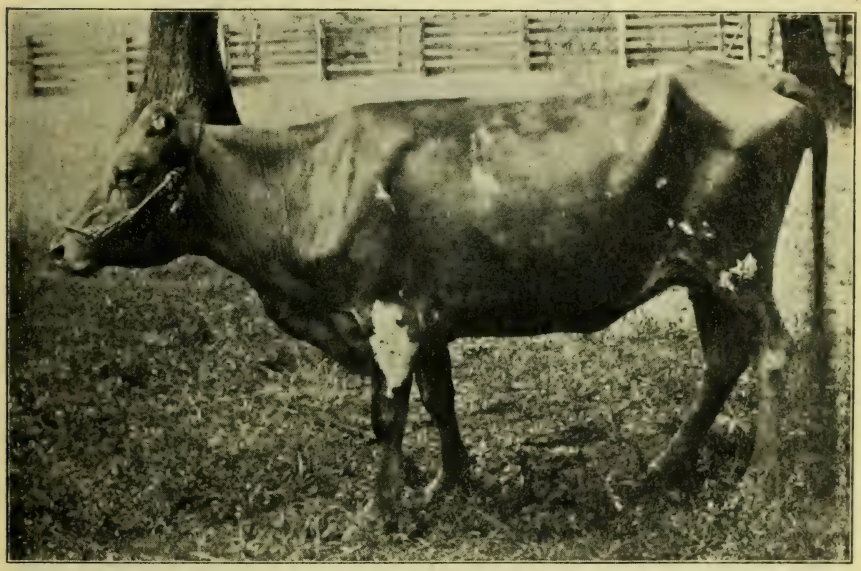


ANGUS BULL.

beef breeds of cattle? Farm crops bring a double value when marketed through live stock. For every ton of cowpea hay, cotton-seed meal or hulls that we feed a beef steer we get a meat value and a fertilizer value.

The more fertilizer material in the food given the cattle the more valuable will be the manure produced. A cow weighing 1000 pounds, well fed and well bedded will produce 74 pounds of manure a day.

Spread this manure on the bermuda pasture as I know of no crop that will give better returns. Disc the pasture well and sow white clover at the rate of 5 pounds of seed per acre. If the practice of top dressing the pasture land with manure and then cultivating well with a disc harrow, was the rule instead of the exception each acre would furnish more grazing for a longer period, carry more cattle and keep them in better condition. The cattle would pay the owner a higher rent for his land.



NATIVE COW.

The first requisite in the economical production of beef is to get a good pasture. Before we can succeed in growing good beef cattle we must break away from the time-honored custom of only putting in pasture such land as will not produce profitable crops of cotton or corn. It is just as absurd to expect cattle to make profitable gains when pastured on the poorest land as it is to attempt to grow cotton or corn on it and make a profit.

The speaker said that we have some farmers in the State who grow beef cattle at a profit and all of them have some of the best land on the farm in pasture—fully realizing the absurdity of attempting to grow the best grasses on the poorest land. The cattle pay a higher rent for the land than the cotton grower and the land improves each year. The State has many facilities for growing good beef cattle at low cost but, apparently, the majority of our farmers do not appreciate the fact. Bermuda and lespedeza, under favorable conditions will carry cattle in splendid shape from May until November and often until the middle of December. Bermuda and lespedeza are our principal pasture plants, but they may be supplemented with large water grass, white clover, red top, orchard grass and many others. The speaker further said that Johnson grass while not considered as a pasture grass will furnish a large amount of the best grazing if the land is divided into several pastures so the cattle can be taken off of one and put on the other before they graze any piece too closely.

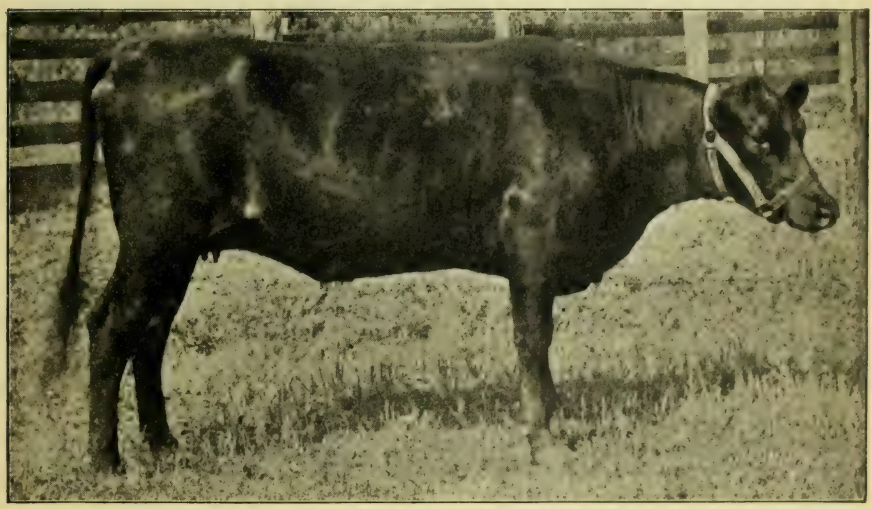
Discussing early spring pasture Professor Lloyd said:

"As a rule we take our cattle off of feed early in the spring and put them on bermuda or other native grass pasture before these grasses have made sufficient growth to carry the cattle without loss, and the result is the cattle lose considerably in weight before there is sufficient grass for making gains. This loss can be prevented by using some good land for early spring pasture. If the land is productive one acre to every two cows will be sufficient. The land should be well prepared and seeded early in the fall, September being, perhaps, the best time. Plant about 2-5 of the land in oats and vetch and the remaining area in alfalfa, melilotus, red top and orchard grass. Such a spring pasture will carry the cattle from April 1st to June 1st, and allow them to make good gains and by this time the bermuda will be large enough to keep the cattle gaining.

The speaker said that the cheapest gains were made on pasture and that there should not be any check in the gains during the pasture period. To do this it will be necessary to supplement the pasture with some soiling crop to be fed green during periods of drouth when the pasture is dry and parched. These drouths usually occur in late summer. Sorghum is a good crop to be used for soiling at such times. The sorghum should be planted in drills about two months before it is needed. Plant the sorghum on good land and cultivate it about twice. The sorghum should be headed by the time it is used and in this form one acre will produce enough to carry fifteen cows for thirty days.

In establishing the herd the speaker did not think it necessary to purchase pure-bred cows, but to select from the native cows of your county or State good, healthy, vigorous young cows with blocky forms and showing by their conformation a tendency to fatten easily and quickly. The milking characteristics should not be overlooked, and I would not select a cow that would not give a good flow of milk when fresh for if the calf is not furnished a liberal supply of milk while young it will not make the rapid growth desired.

In buying a bull it is a very short-sighted policy to let a few dollars stand in the way of getting a good one. We should not be persuaded to buy a grade no matter how good an individual he may be just because the cows are common or native stock. We should



FIRST CROSS OF ANGUS BULL AND NATIVE COW.

grade up and when the females are of native stock the bull should be purebred. The native cows are not prepotent and with a pure-bred bull the calves will naturally inherit the qualities of the better bred sire. The bull should not only be purebred and registered, but a good individual and a fair representative of his breed.

In conclusion the speaker said:

"Frequently in urging the necessity of buying purebred beef bulls for the purpose of grading up our common cattle the objection is made that "our climate is not adapted to the improved breeds of beef cattle." Is it fair to charge up to the climate our own mistakes and failures? It is not the climate but the treatment that fails to agree with the improved breeds of beef cattle. This same treatment does not agree with scrubs but the scrub has already fallen so low in quality that any further deterioration would not be easily detected. Perhaps the men who have reached the conclusion that the improved breeds of beef cattle are not adapted to our climate have also made the mistake of putting all the poor land on the farm in pasture and all the good land in cotton and are using a grade bull because he was bought cheap."

Discussion.—At the close of Professor Lloyd's talk the relative merits of our native cattle and cattle of the improved breeds, when both were under favorable conditions and well fed, was discussed at some length. There were those present who thought that when our native cattle were given the best attention and fed well that they made about as good gains as the beef breeds. Professor Lloyd in answer to a question in regard to the value of breeding exhibited three drawings showing a purebred bull, a native cow and the grade calf.

FARM DRAINAGE.

Prof. J. W. Fox, of the Mississippi Agricultural and Mechanical College discussed this subject under the three heads: Removal of surface water from land, Lowering the water level on such land, and The prevention of hilly land from washing.

Removal of surface water.—He said: Water logged soil will not produce favorably. There are some plausible reasons for this fact. The standing water destroys useful bacteria; prevents free circulation of air necessary to the growth of plants; reduces the temperature of the soil, keeping it cold till late spring; and makes it impossible to properly pulverize the soil for a good seed bed. Surface water should be removed from the soil as early as possible, and to accomplish this an outlet must be had. Such an outlet usually exists in the form of a creek or branch, which should be continually improved by keeping all growth cut out, drifts burned out during the summer and the channel deepened when necessary. These natural drains can be kept in good condition and gradually

improved at little expense if care and judgment are exercised in their management. If an outlet ditch has to be made, as is frequently the case for parts of the farm, the greatest possible care should be used in its location. A great deal of money is wasted in digging ditches that do not have the proper grade and consequently fill up. The ditch should not only have sufficient fall, but the fall should be uniform, for the reason that water flowing down a steep grade will gather considerable sediment, which will be deposited if the flow is checked by a gentler incline, and the ditch will soon fill up. It is best to lay off such ditches with some kind of a leveling instrument before spending money in their construction. Shallow drains from all the low parts of the field should lead into these main ditches. These need not be expensive. They can frequently be made with a plow; or, after plowing, they may be finished with a drag scraper. They should be broad and shallow, and the dirt from them should be distributed in the adjoining low places, rather than piled immediately on either side. If properly made, they should not be more in the way than a turn row, and often the rows may cross them without inconvenience. The efficiency of these drains depends more on their location than on their depth. Water from adjoining hills often makes the bottom land wet. This water should be intercepted by a ditch at the foot of the hill.

The best form of ditch is one broad at top with banks sloping gently to the bottom. Such a ditch is not only much cheaper to construct—with plow and scraper—but is easier to keep in repair, and occupies much less ground.

Under drainage.—If a farmer decides to go to the expense of underdraining his land, there is but one practical way, and that is to use the best drainage tile. There are various make shifts such as pole or plank drains, but they are unsatisfactory and do not last. Tile drainage is expensive. Whether or not it will be a profitable investment will depend on circumstances. For instance, it would not be advisable to tile drain a piece of land to rent at two dollars per acre. On the other hand, if a farmer is giving his land the best possible tillage, using fertilizers liberally and growing crops to the value of twenty-five, fifty or seventy-five dollars per acre, as is being done, especially by the truckers, underdrainage might easily be a profitable investment.

Tile drainage is not an experiment. Illinois has 700,000 miles of tile drains, and more are being added every year. There is no

doubt that it would increase the productive powers of much of the land in this State, but it would be poor judgment to spend so much money and then cultivate so indifferently.

Depth of drains.—Tiles should not be deeper than four feet in this latitude, and in very stiff soil three feet is better.

Distance between drains.—This will depend on the depth of the drains and also on the character of the soil. From fiifty to one hundred feet apart will generally answer.

Size of tile.—For single drains not over five hundred feet long two inch tiles will be sufficient. For mains into which laterals flow, larger sizes will be necessary.

Kind of tile.—Hard burned smooth tile is best; soft tile will sometimes crush. It is a mistake to use the latter supposing the water will not get into the former fast enough. Hard burned tile, laid smooth and straight, with the joints fitted as snugly as possible, with uniform fall will give best results. In filling the ditch the stiffest dirt should be placed immediately over the tile and pressed down firmly. Water does not flow into the tile from the top but from the bottom.

The outlet of a tile drain requires attention, this being frequently the weak point in its construction. A satisfactory way is to have the tile end in a box made of rich pine. The outlet should be covered with wire netting to keep out animals that might close the drain. Neglect of this inexpensive precaution is a common source of trouble.

Hill-side drainage.—On the subject of hill-side drainage the speaker said:

This work has been sadly neglected in this State. Parts of many farms have been washed into gullies and abandoned, and many others will follow the same course if not looked after. Cheap land in great abundance was the primary cause of this neglect and the force of habit has continued it too long. There is no more desolate picture than the red gullied fields and abandoned homes that are too frequently seen. These tell a story of years of toil that have availed nothing; the clearing of the land, the removal of the fallen timber, the fencing, and the building. Who will doubt that if the one hundredth part of this labor had been given to properly constructing hill-side ditches and carefully looking after them each year, the farm would still be profitable and a permanent home. Any improvement in the methods of farming in the hill section is out of the question until the land is prevented from washing away. This can be done. It is not expensive. What it will require, however, is the exercise of

good judgment in laying out the ditches and care thereafter in keeping them in shape. In the first place, do not try to run these ditches by the eye alone. Grades are very deceptive; therefore it is necessary to use some kind of leveling instrument to do the work properly.

Next in importance, have these ditches free from all obstruction before the winter rains set in. An hours work on a weak place may save the entire hill-side from being gullied.

There are several systems proposed for preventing hill land from washing. The two general methods are: level terraces and hill-side ditches.

Level terraces.—These are hill-side ditches without fall; the idea is that the bank of each ditch will hold the water that comes against it until it is absorbed by the soil. In sections where the soil is loose, with porous subsoil, level terraces are reported satisfactory. Where they control the water they are undoubtedly preferable to hill-side ditches, because none of the soil is carried off by the water.

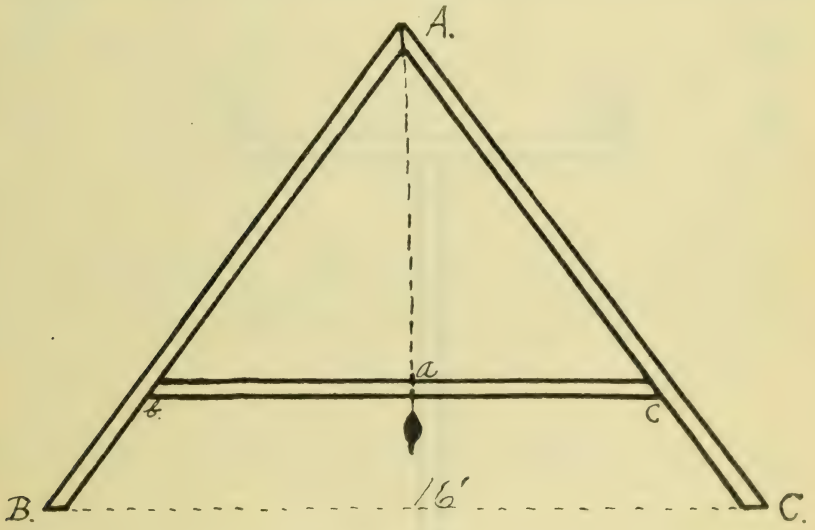


FIG. X.

Hill-side ditches.—These ditches are given sufficient fall to carry the water without washing the ditch. The fall should be uniform; or, if ditch be long, it may be slightly increased toward the end, but never decreased. The proper fall will depend somewhat on the character of the soil and the steepness of the hill-side; from seven to fourteen inches to a hundred feet are used. These ditches will usually run into the natural drains in the opposite direction

to the flow of the water in these drains, for the simple reason that a uniform fall can be had by running them this way. Rows should be run with practically the same fall as the ditch, and they should empty their water into the ditch in the same manner and for the same reason. These ditches should be broad and shallow, with broad banks on the lower side.

Instruments.—The best instrument for laying off drains is the engineers level, but it is too expensive for general use. Instrument makers now make what is called a drainage level which they sell for twenty-five dollars. There is a cheap farm level which will answer the purpose for running hill-side ditches, that costs about five dollars. There are several forms of home-made levels in use. In the absence of better instruments, these are very useful and with careful handling can be made to do very good work. Three forms are represented.

Figure X is called the "A level." It is made of light sap pine, 1x1½ inches. The legs are 16 feet apart at bottom and are hinged at A. The cross bar is hinged at C and has hook and eye at B. It may be folded up to facilitate carrying to and from the field. Set up on a level floor and mark where plumb-line swings; then place a two inch block under one foot and mark

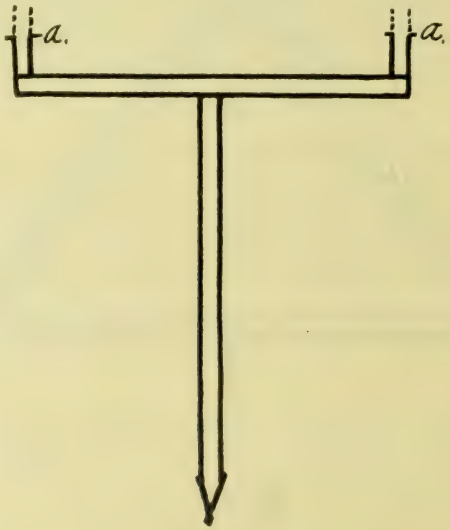


FIG. Y.

plumb-line. In running a level terrace, keep plumb-line on first mark, or in centre; for a hill side ditch, let plumb line swing on second mark. This will indicate a fall of two inches to 16 feet, or about 12 inches to 100 feet. This level cannot be used on a windy day.

Figure Y is sometimes called a "water level." A piece of iron pipe is bent

at both ends is fastened at the centre to a staff about four feet long. Glass tubes, open at both ends, are connected with the ends of the pipe at a, a. To use the level, fill the pipe and the tubes nearly to the top with colored water. Sight across top of water which will be a level line.

Figure Z is a light frame, made as shown in the cut, and having a spirit level at C. From A to B is 16 feet. Place the instrument on a level floor and adjust the length of the legs until the bubble comes to the centre of its run. It

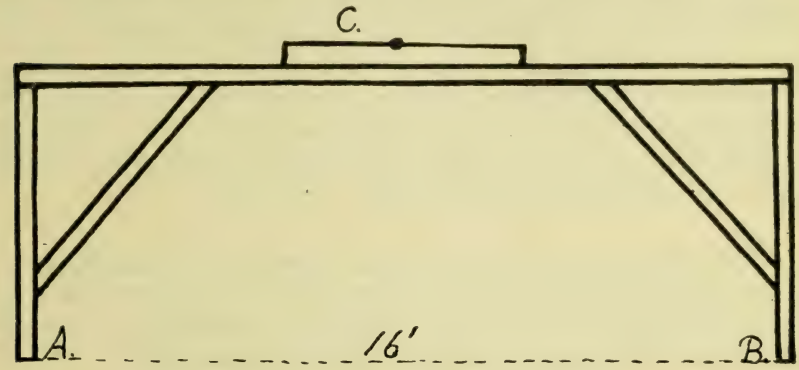


FIG. Z.

can then be used to lay out a level terrace. If wanted for running hill-side ditches, saw off two inches of one end. When the bubble is in the center, it will indicate a fall of two inches to 16 feet or approximately 12 inches to 100 feet.

THE RELATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE TO THE FARMER.

Mr. C. B. Smith, of the U. S. Department of Agriculture said that Congress gave the department this year nearly $4,000,000 with which to carry on work in agriculture and that no other government in the world made such splendid appropriations in the interest of its farmers.

In discussing the work of the department in its relations to farmers he said we will pass over the work of the Weather Bureau of the Department which gives daily, and often hourly, warnings of the approach of storms and frosts on land and sea, in every hamlet of the

country from Oregon to Porto Rico; also the work of the Bureau of Animal Industry, whose watchfulness and skill have made American animals the soundest and healthiest in the world; and take up the work of the department with certain specific farm and garden crops.

Wheat.—In the case of wheat, the Department's investigations showed that we were importing about 16,000,000 pounds of maccaroni yearly, and that it required wheat of a special milling quality to produce maccaroni flour. An agent was therefore sent to the maccaroni wheat districts of Europe; some of these hard wheats were imported and distributed to farmers with the result that some portions of the West and Northwest have been found especially suited to the growth of this crop. The maccaroni produced from wheat grown between the 97th and 100th parallels of latitude has been found equal to that of any wheat grown in the world.

Through the agency of the U. S. Department of Agriculture markets have been found for this wheat, and millers have been induced to put in special machinery to grind it. Over 2,000,000 bushels of maccaroni wheat were grown in the West this year.

Tobacco.—A considerable amount of work has been done by the Department with tobacco. The tobacco grown in Sumatra, off the southeastern coast of Asia, has long been the standard tobacco used for wrapping cigars of the first quality. Some 5,000,000 pounds of this tobacco have been yearly imported into this country, notwithstanding an import duty of $1.85 per pound. Cuban tobacco is the standard tobacco used for filling cigars. These tobaccoes, when grown as we ordinarily plant tobacco in this country, were of inferior quality and brought inferior prices. They are now being successfully grown in Florida on a commercial scale, under cheese-cloth shade. The methods of growing under shade and fermenting tobacco observed in Florida have also, through the agency of the Department co-operating with the Connecticut Experiment Station, been applied to Connecticut conditions, where this year nearly 1,000 acres of Sumatra wrapper are being grown under cheese-cloth shade. The results of this work have shown that as good Sumatra tobacco can be grown in this country as in Sumatra itself. In fact Florida grown Sumatra tobacco at the Paris Exposition was given 20 points by the jury of awards when native Sumatra tobacco scored but 18 points. Sumatra tobacco grown last year at the Connecticut Station under shade

sold for an average price of $1.91 per pound. Mention of other work was made as follows:

Rice.—Four years ago this country produced less than one-half the rice we consumed. We had greatly improved our methods of rice culture, but the rice we were growing was defective in milling properties. From 40 to 60 per cent of the grains were broken in their preparation for market, and this greatly reduced their market value. An agent was commissioned by the Secretary to visit Japan and study the rice industry of that country. He brought back 10 tons of Kiushu rice. This was distributed to the rice growers of the South, with the result that the following year the rice planters produced 100 tons of this seed. It yielded better than the old variety and had a short thick grain that was but little broken up in milling. This year the United States will produce all the rice it consumes. The agent reports that one American with his team and improved machinery can produce more rice than 400 Chinese working in the old way. The rice industry of this country will be second only to the wheat industry among the cereals. Its value has already been increased $10,000,000 annually by this importation.

Cotton.—A disease of cotton, which is very common in South Carolina and Alabama, and reported to a lesser extent by Georgia, Florida, and Arkansas, is being studied by the Department. The disease is known as the cotton wilt. It has been so severe in some places that plantations of 20 to 50 acres had to be abandoned. The work of the department experts on this disease indicates that varieties of cotton can be selected and bred up which will be resistant to this disease. Some Egyptian varieties imported by the Department are proving especially resistant.

The cowpea wilt is being treated in the same manner. The little Iron variety has been found to have an unusual degree of resistance to this disease and to stand up where practically all other varieties around it have been killed.

Hemp.—While on this subject of cotton, which is a fiber plant, mention might also be made of hemp. The fiber expert of the Department, who has just returned to Washington from a tour of inspection, informed me that out in Nebraska they were planting, cultivating, cutting and retting hemp for $7 per acre; this included the rent of the land. They raise about 800 pounds of fiber per acre, which sells for about 5 cents per pound. This shows a fairly good margin of profit for hemp in that State. Owing to the more favorable climatic conditions, about double this quantity of fiber or from 1,500 to 2,000 pounds can be produced per acre in Mississippi.

The speaker said:

As a result of the work of the Department, alone and in co-operation with the experiment stations and farmers, over 370,000,000 pounds of beet sugar was produced in this country last year; 26 factories have been built, involving a capital of more than $11,000,000. This crop now brings to the farmers of this

country annually over seven and a half million dollars. Mr. Smith also told of the work of the Department with alfalfa and *Bromus inermis* which had proven of great value to the semi-arid region between the 97th and 100th parallels of latitude and to the Northwest generally. Turning to the horticultural work of the Department he told of the introduction of the fig fly (Blastophaga) by the Department and the consequent successful production of the Smyrna fig in California. Last year over 75 tons of Smyrna figs were produced in California, and they were equal in every respect to the imported figs. He also referred to the successful introduction of Dates into Arizona, southern California and other Southern States through the efforts of the Department. Through the encouragement of the Department Tea is also being successfully grown in South Carolina.

Shipping fruit in cold storage.—Mr. Smith referred to other work of the department as follows:

The Division of Pomology is investigating, among other things, the possibility of shipping fresh fruit to England in cold storage. Thus far apples and peaches have been sent. Four shipments of early apples, sent in 6-basket carcarriers from Delaware netted the growers about $1.20 per carrier. This fruit was selling in the New York market at the time for about 50 cents net for 5-8 bushel baskets.

"Elberta peaches packed in Georgia in the same way as for the New York market, that is, without wrapping, netted all the way from $1.52 to $2.70 per carrier. This amount the growers received, after paying freight, storage, commission, cost of package, etc. These prices in nearly every instance were considerably in excess of the New York market, for the same grade of goods, and in no instance, except with one crate, were the prices received less than the New York market. One shipment of apples was poorly packed, and failed to pay expenses. These experimental shipments, on the whole, show, first that we can ship early apples and fresh peaches to Europe when care is taken in packing them, and secondly, that there is money in it. This opens up a new market to our horticulturists for these fruits, and practically insures profitable sales in years of superabundant crops.

Grapes.—The expert in grape culture of the Division of Pomology is successfully introducing improved varieties of European grapes for the Southern States. Cooperative experiments are being carried on with a number of experiment stations and individuals in these States and gratifying results are already reported.

Farmers Bulletins.—I wish to call the attention of the farmers present to the series of Farmers Bulletins published by the Department. There are now nearly 160 of these bulletins. They treat of a wide range of subjects, many of them directly relating to the conditions of agriculture in the South. These bulletins are written in a plain, practical manner for the use of farmers, and are full of suggestions. Usually they contain the latest advice available on the best methods of handling and utilizing farm crops.

In the series of Farmers Bulletins there is a sub-series entitled Experiment Station Work. These are published by the Office of Experiment Stations and contain brief summaries of the results secured at the different experiment stations throughout the country with a vast number of farm subjects. Each number contains from eight to a dozen articles, all based on latest results in experimental work in this country.

Below is a list of Farmer's Bulletins available for distribution. Copies will be sent to any address on application to Senators, Representatives and Delegates in Congress, or to the Secretary of Agriculture, Washington, D. C. The missing numbers have been discontinued, having been superseded by later bulletins. The list is as follows:

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16 Leguminous Plants. Pp. 24.
21 Barnyard Manure. Pp. 32.
22 The Feeding of Farm Animals. Pp. 32.
24 Hog Cholera and Swine Plague. Pp. 16.
25 Peanuts: Culture and Uses. Pp. 24.
27 Flax for Seed and Fiber. Pp. 16.
28 Weeds: And How to Kill Them. Pp. 32.
29 Souring and Other Changes in Milk. Pp. 23.
30 Grape Diseases on the Pacific Coast. Pp. 15.
31 Alfalfa or Lucern. Pp. 24.
32 Silos and Silage. Pp. 32.
33 Peach Growing for Market. Pp. 24.
34 Meats: Composition and Cooking. Pp. 29.
35 Potato Culture. Pp. 24.
36 Cotton Seed and Its Products. Pp. 16.
37 Kafir Corn: Culture and Uses. Pp. 12.
38 Spraying for Fruit Diseases. Pp. 12.
39 Onion Culture. Pp. 31.
40 Farm Drainage. Pp. 24.
42 Facts About Milk. Pp. 29.
43 Sewage Disposal on the Farm. Pp. 20.
44 Commercial Fertilizers. Pp. 24.
45 Insects Injurious to Stored Grain. Pp. 24.
46 Irrigation in Humid Climates. Pp. 27.
47 Insects Affecting the Cotton Plant. Pp. 32.
48 The Manuring of Cotton. Pp. 16.
49 Sheep Feeding. Pp. 24.
50 Sorghum as a Forage Crop. Pp. 20.
51 Standard Varieties of Chickens. Pp. 48.
52 The Sugar Beet. Pp. 48.
53 How to Grow Mushrooms. Pp. 24.
54 Some Common Birds. Pp. 40.
55 The Dairy Herd. Pp. 24.
56 Experiment Station Work—I. Pp. 31.
57 Butter Making on the Farm. Pp. 16.
58 The Soy Bean as a Forage Crop. Pp. 24.
59 Bee Keeping. Pp. 32.
60 Methods of Curing Tobacco. Pp. 16.
61 Asparagus Culture. Pp. 40.
62 Marketing Farm Produce. Pp. 28.
63 Care of Milk on the Farm. Pp. 40.
64 Ducks and Geese. Pp. 48.

65 Experiment Station Work—II. Pp. 32.
66 Meadows and Pastures. Pp. 28.
68 The Black Rot of the Cabbage. Pp. 22.
69 Experiment Station Work—III. Pp. 32.
70 Insect Enemies of the Grape. Pp. 23.
71 Essentials in Beef Production. Pp. 24.
72 Cattle Ranges of the Southwest. Pp. 32.
73 Experiment Station Work—IV. Pp. 32.
74 Milk as Food. Pp. 39.
75 The Grain Smuts. Pp. 20.
76 Tomato Growing. Pp. 30.
77 The Liming of Soils. Pp. 19.
78 Experiment Station Work—V. Pp. 32.
79 Experiment Station Work—VI. Pp. 28.
80 The Peach Twig-borer. Pp. 16.
81 Corn Culture in the South. Pp. 24.
82 The Culture of Tobacco. Pp. 24.
83 Tobacco Soils. Pp. 23.
84 Experiment Station Work—VII. Pp. 32.
85 Fish as Food. Pp. 30.
86 Thirty Poisonous Plants. Pp. 32.
87 Experiment Station Work—VIII Pp. 32.
88 Alkali Lands. Pp. 23.
89 Cowpeas. Pp. 16.
91 Potato Diseases and Treatment. Pp. 12.
92 Experiment Station Work—IX. Pp. 30.
93 Sugar as Food. Pp. 27.
94 The Vegetable Garden. Pp. 24.
95 Good Roads for Farmers. Pp. 47.
96 Raising Sheep for Mutton. Pp. 48.
97 Experiment Station Work—X. Pp. 32.

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98 Suggestions to Southern Farmers. Pp. 48.
99 Insect Enemies of Shade Trees. Pp. 30.
100 Hog Raising in the South. Pp. 40.
101 Millets. Pp. 28.
102 Southern Forage Plants. Pp. 48.
103 Experiment Station Work—XII. Pp. 32.
104 Notes on Frost. Pp. 24.
105 Experiment Station Work—XII. Pp. 32.
106 Breeds of Dairy Cattle. Pp. 48.
107 Experiment Station Work—XIII. Pp. 32.
108 Saltbushes. Pp. 20.
109 Farmers' Reading Courses. Pp. 20.
110 Rice Culture in the United States. Pp. 28.
111 Farmers' Interest in Good Seed. Pp. 24.
112 Bread and Bread Making. Pp. 39.
113 The Apple and How to Grow It. Pp. 32.
114 Experiment Station Work—XIV. Pp. 28.
115 Hop Culture in California. Pp. 27.
116 Irrigation in Fruit Growing. Pp. 48.
117 Sheep, Hogs, and Horses in the Northwest. Pp. 28.
118 Grape Growing in the South. Pp. 32.
119 Experiment Station Work—XV. Pp. 31.
120 Insects Affecting Tobacco. Pp. 32.
121 Beans, Peas, and other Legumes as Food. Pp. 32.
122 Experiment Station Work—XVI. Pp. 32.
123 Red Clover Seed: Information for Purchasers. Pp. 11.
124 Experiment Station Work—XVII. Pp. 32.

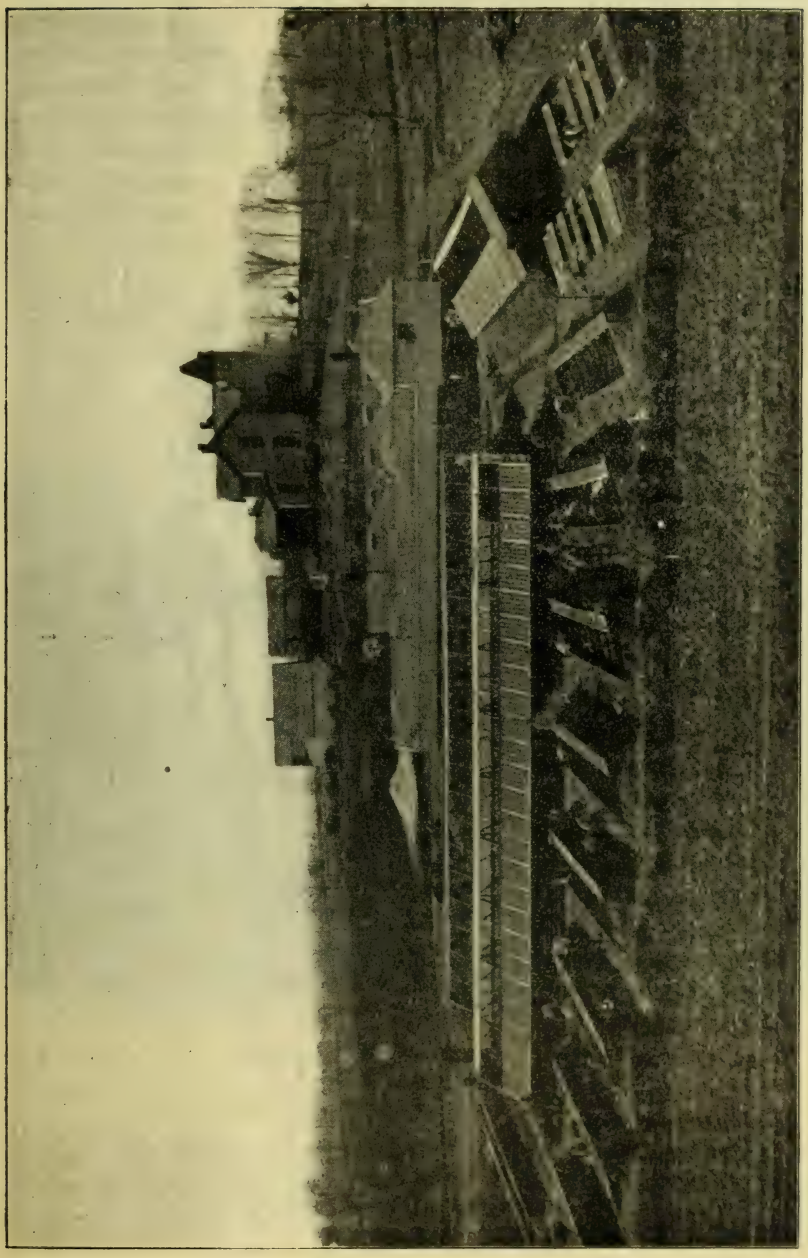
125 Protection of Food Products from Injurious Temperatures. Pp. 26.
126 Practical Suggestions for Farm Buildings. Pp. 48.
127 Important Insecticides. Pp. 42.
128 Eggs and Their Uses as Food. Pp. 32.
129 Sweet Potatoes. Pp. 40.
130 The Mexican Cotton Boll Weevil. Pp. 30.
131 Household Test for Detection of Oleomargarine and Renovated Butter. Pp. 11.
132 Insect Enemies of Growing Wheat. Pp. 40.
133 Experiment Station Work—XVIII. Pp. 32.
134 Tree Planting in Rural School Grounds. Pp. 38.
135 Sorghum Syrup Manufacture. Pp. 40.
136 Earth Roads. Pp. 24.
137 The Angora Goat. Pp. 48.
138 Irrigation in Field and Garden. Pp. 40.
139 Emmer: A Grain for the Semiarid Regions. Pp. 16.
140 Pineapple Growing. Pp. 48.
141 Poultry Raising on the Farm. Pp. 16.
142 The Nutritive and Economic Value of Food. Pp. 48.
143 The Conformation of Beef and Dairy Cattle. Pp. 44.
144 Experiment Station Work—XIX. Pp. 32.
145 Carbon Bisulphid as an Insecticide. Pp. 28.
146 Insecticides and Fungicides. Pp. 16.
147 Winter Forage Crops for the South. Pp. 36.
148 Celery Culture. Pp. 32
149 Experiment Station Work—XX. Pp. 32.
150 Clearing New Land. Pp. 24.
151 Dairying in the South. Pp. 48.
152 Scabbies in Cattle. Pp. 24.
153 Orchard Enemies in the Pacific Northwest. Pp. 39.
154 The Fruit Garden. Preparation and Care. Pp. 20.
155 How Insects Affect Health in Rural Districts. Pp. 20.
156 The Home Vineyard. (In press.)
157 The Propagation of Plants. (In press.)
158 How to Build Small Irrigation Ditches. (In press.)

COMMERCIAL HORTICULTURE IN MISSISSIPPI.

Commercial Horticulture in Mississippi was discussed by Prof. A. B. McKay, horticulturist of the Experiment Station and professor of horticulture at the Agricultural College. He said in part:

Commercial horticulture is the growing of fruits, vegetables and flowers for market. As a business in Mississippi it began to assume shape about thirty years ago. Occasional shipments of fruits and vegetables were made to nearby towns and to distant cities before the civil war. When these goods reached northern cities in fair condition phenominal prices were sometimes realized. In the records, mention is made of a few bushels of peaches, grown near Brookhaven, that sold in New York City at $32.00 per bushel; of a barrel of cucumbers that brought $60.00 in Chicago; and of a hundred-acre peach orchard near Vicksburg that netted the owner $7,000.00 in one year. During the sixties Canton made small shipments of tomatoes, peaches and pears to Memphis, New Orleans and Chicago. Corinth, Booneville, Holly Springs, Vicksburg and Crystal Springs made trial shipments at about the same date. As a rule these early shippers were men of wealth who engaged in horticulture merely as a diversion. The thought of growing and marketing these products as a means of making a living did not enter the minds of those who practiced garden and orchard craft till late in the sixties. A few men conceived the idea of extending their plantings so as to ship more regularly and in larger quantities. Encouraged by their success others were enlisted. Crystal Springs, Terry and Madison led off in the work. Canton, Durant and Boonville soon followed. Local societies were organized at the meetings of which were discussed matters of interest to those engaged in this new enterprise.

There was much to discourage the pioneers. Express rates were exhorbitant and freight service was too slow. Goods were roughly handled by railroad employees, and the best cars were unsuited to carry such perishable goods in proper condition to any considerable distance. Little was known of correct methods of grading and less of suitable packages and attractive packing. Practically nothing was known of markets and commission men. In matters pertaining to the forwarding of early plants, best market varieties, and the planting, cultivating and handling of large areas in garden and orchard crops each grower was largely his own teacher. The



GREEN HOUSES, COLD FRAMES AND HOT BEDS.

encouraging feature at this time was the fact that the demand for the products was far in excess of the supply and prices ruled high.

Through the more active local societies and the State Horticultural Society much was accomplished in the way of lowering transportation charges, in the construction of suitable refrigerator cars, and in having goods handled with greater care. Through these organizations the best knowledge obtainable concerning every detail of the business was disseminated directly among those most concerned. The enthusiasm manifested by those who first espoused the cause soon enlisted an army of earnest workers, till the business has grown to be quite extensive in the State, as well as most lucrative and desirable as a vocation.

Commercial horticulture must be limited to within a few miles of our largest towns, and to within easy reach of shipping points

SMALL FRUITS. TEST OF VARIETIES.

along railroads furnishing proper shipping facilities and rapid transit to distant markets. The trunk lines of railroads running from south to north through the State give us rapid transit and communication

with the centers of population in the East, the North and the Northwest. Intersecting roads are opening up, in many sections of the State, large areas of fruit and vegetable land hitherto inacccessible. Our climate, rainfall and diversified soil favors the perfect development of nearly everything in the list of fruits, vegetables and flowers. Recently the railroads have manifested a deeper interest in the work by offering better service and otherwise encouraging the enterprise along their lines.

ABUNDANCE PLUM.

Crystal Springs, Madison, Durant, and Boonville must look to their laurels if they would continue to hold leadership in the shipping of horticultural products. Interest is awakening in many sec-

tions of the State and diligent search is being made for large areas of our best fruit and vegetable land by agents from other States.

The branch experiment station in Pearl River county will soon be able to report results from carefully conducted experiments with both fruits and vegetables. These and similar experiments are being watched with much interest, as they mean so much to the trucking interest in the extensive pine section of South Mississippi. With some products early shipment has much to do with net proceeds.

Time was when it paid very well to grow fruits and vegetables in a small way, when it did not matter about paying particular attention to quality, color, grading, packing, etc. In recent years conditions have changed. New problems confront horticulturists every season. Success now means organized and united effort and the practice of up-to-date methods in every detail of the work. Competition is growing sharp, and "eternal vigilance ' all along the line must be the watchword. Among the many questions which demand careful consideration are the following: The adaptability of the crop to soil and to climatic conditions; the selection of varieties best suited to the market; fertilizers and their proper use; when and how to cultivate; the combating of insect pests and plant diseases; division of labor and the training of skilled hands; and the gathering, grading, and packing of goods intended for shipment.

Isolated growers who plant only a few acres and, in consequence, must ship in small quantities and depend on the pick-up train to handle their goods cannot cope with growers who ship in car lots. It is not only important that fruits and vegetables be shipped in car lots but also that each car be loaded with but one article. Better still, if with such goods as tomatoes, strawberries, and peaches that the volume of the business would admit of loading each car with but one grade. It is one thing to grow the goods and load them in cars properly; it is quite another thing to place them on the market and with dealers who will get the best returns for shippers. Concert of action among competing shipping points frequently prevents unnecessary gluts. It is all important that shippers be thoroughly posted on market conditions in every section of territory within safe shipping distance. So separate and distinct is this matter of keeping posted on the market from that of growing the produce, and so much does it concern each and every producer, that no shipping community can afford to place the responsibility of consigning goods in any other than the best hands. Whether this particular work should be

entrusted to a committee or to one man will depend entirely upon circumstances. In making selections and in placing responsibility don't forget that "the laborer is worthy of his hire."

In conclusion the speaker said :

"I appeal to every horticultural community to organize thoroughly; to meet sufficiently often to discuss and to solve, if possible, every question of importance to the business ; to plan ahead for carrying out the work proposed in the best manner possible. Through a good State society, aided by local societies, it is easier to reach the railroad authorities and to secure much needed legislation. By united effort we can and should make Mississippi famous as a land of gardens, vineyards, orchards and beautiful homes."

DAIRYING IN MISSISSIPPI.

Mr. J. S. Moore, Professor of Dairy Husbandry, Mississippi A. and M. College, spoke as follows on : "Mississippi As a Dairy State."

The impression that prevailed for so long that cotton should be relied upon as the only money crop in the South is fast dying out. We are beginning to realize that a one-crop system must sooner or later impoverish the soil and render it unproductive. A diversity of crops must be grown if the land is made to retain its fertility, and in order to secure the most profitable returns it is found necessary to convert at least a portion of this raw material into a higher priced product.

The idea that butter of the best quality could not be produced in the South has been shown to be without foundation, and now some practical dairymen are making a product equal to that made in the dairy States of the Northwest.

The mild climate of this State renders expensive barns unnecessary. In fact, for a great portion of the year shelter is not needed further than to provide a place for feeding and milking the herd. With this mild climate also comes a long pasturing season and an opportunity to grow a diversity of crops.

Cheap feed in the way of forage crops should command the attention of every thoughtful Mississippi farmer. On land that can be bought for less than one-fifth of the price of much of the best land in the so-called dairy States, he can raise about double

the forage that the farmer of those sections can produce. For instance, timothy yields one to two tons of hay to the acre in the States where dairying is practiced to a large extent, and red clover about the same, while in this State from two to four tons of Johnson grass hay is not an unusual yield. The feeding value of the latter is also superior pound for pound to timothy. Cowpeas, equal to red clover in value, will give as large yield as the clover, and can be grown in from three to five months, allowing ample time to secure another forage crop, such as sorghum, on the same land during the year—the sorghum alone often making from three to five tons of good hay to the acre. Other forage crops that are successfully grown in this State are bermuda, lespedeza, alfalfa, and melilotus.

For a large portion of the year good pasture can be provided for the cow. Bermuda and lespedeza should probably be relied upon to supply the greater portion of the grazing during the summer and fall months, although Johnson grass, if not pastured too close will make excellent grazing. In the winter and spring months, oats and vetch, rye and vetch, or barley and vetch will furnish pastures that cannot be excelled for milk and butter. In the fall months, when pastures afford little grazing, a soiling crop of sorghum can be had at small cost and such a crop should always be grown where there are dairy cows to be fed.

In addition to the forage crops and pastures possible in this State, we have in cotton seed and its products the cheapest food that can be found in the country. Cotton seed and cottonseed meal are very rich in protein which makes them desirable feeds to mix with the rough forage crops. When fed intelligently there are no feeds that will give better returns than cotton seed and cotton seed meal.

In testing the comparative values of some of the grain feeds used in the South for dairy cattle we found that one pound of cottonseed meal equals 2 pounds of corn meal, and that one pound of cottonseed equals 1.17 pounds of corn meal. We also found that one pound of cottonseed meal has a feeding value equal to 1.5 pounds of wheat bran. For a long time the feeding value of cotton seed was not recognized. In fact, until a few years ago the seed may be said to have had no value. They were piled in heaps to rot or thrown into streams where they decayed, causing positive loss. They are now selling in this State for $20.00 a ton, showing that the farmers are beginning to realize their value. The manure from cattle fed on cottonseed and cottonseed meal is much richer than that from cows

fed largely on corn meal, as is shown by the following table:

The fertilizing value of one ton of cotton seed equals.....$10.12
The fertilizing value of one ton of cottonseed meal equals..... 21.32
The fertilizing value of one ton of corn meal equals..... 4.98

One ton of corn meal therefore contains less than one-half as much fertilizing elements as cotton seed and less than one-fourth as much as is contained in cottonseed meal. From 75 to 90 per cent of the fertilizing material of the above feeds is contained in the manure after feeding to cattle.

Mr. Moore said:

It is sometimes stated that the cows now in the State will not yield enough milk and butter to pay a profit and that the farmer cannot afford to sell these and buy high-priced animals. The average yield of butter for each cow is about one hundred and twenty pounds. This amount will scarcely pay for the feed consumed and yet it is possible to take these cows and in a few years build up herds that will pay their owners a good profit. Two years ago the College started with a herd of average cows, and by kindness, regularity in milking, wattering, and feeding, skillful breeding, and getting rid of the unprofitable cows, we now have the average yield of butter to over two hundred and fifty pounds. Any farmer can do the same thing if he will care for the cows properly. I do not wish to be misunderstood in regard to pure-bred stock for I believe that they have a place, and a very important one, but I do say that without more care and better feed than the average cow receives the pure-bred dairy cow will prove a failure. Further, I do not deem it wise for the general farmer to dispose of his native and grade cattle to purchase registered animals. Take the best cows you have, buy a well bred bull of some of the dairy breeds, let him be a good individual, and then with proper care, management, and feed, a select dairy herd can soon be established.

Only a small amount of the butter bought in this State is made within its borders. At present there is a great demand for dairy products and from the nature of things there must of necessity continue to be a market for good butter at highly profitable prices. On many farms the small dairy could be made to pay well. It would tend to increase the fertility of the soil, do away with the credit system practiced by so many farmers, because the farmer may find a ready sale for dairy products every month in the year, and it would enable all the labor on the farm to be profitably employed. If suitable conveniences are furnished the labor may not only prove profitable but pleasant.

The children brought up on a dairy farm, where the work is conducted on a systematic basis and where they are taught to handle, love, and care for the cattle as they should be cared for, have a greater opportunity to develop the powers of observation than those children reared upon exclusive cotton farms.

When the possibilities that farm life offers are recognized and appreciated as they should be, the question of "how shall we keep the boys on the farm"

will be solved. Love for the farm and farm life will be so strongly developed that when the farmers' boys see the great field for labor and the opportunites offered to those equipped for the work, they will naturally turn their attention, time, and energy in this direction.

BREEDING AND REARING A PROFITABLE DAIRY WORKER.

Mrs. Ada F. Howie, of Wisconsin, said that while it might seem a trifle strange to some that she should speak on a subject that heretofore men have thought belonged wholly to themselves, a moments thought would recall the fact that the calf that mother and the girls raised always made the best cow. Not that mother and the girls were wiser or more determined in their efforts to bring about good results, but because patience and kindness are most important factors in the rearing of a profitable dairy worker, and women were born to be patient.

There is a subtle tie of sympathy between the bovine and human mother that cannot be appreciated by one unfamiliar with conditions. It is the mysterious bond of motherhood, and its beneficial influence on past and present generations of dairy cattle is so well known to the student of animal husbandry that none would challenge the statement that the choicest bred dairy cattle of the world owe their development to the women of different countries. This being the case, when American women bend their energies to skillful breeding and pains-taking dairy methods, they are not seeking notoriety as the "new woman" but merely following the commendable example set by those of the old world in an effort to stimulate the dairy interest of our Republic.

A noted man was once asked when to begin the training of a child. The answer was, "Two hundred years before he was born." The wisdom of this answer is quite apparent. Two hundred years of valor and honor on one side; two centuries of refinement and culture on the other, would do much to firmly establish from the start the little one in the esteem of his fellow men.

She said that this same rule was applicable to the up-building of our herds. Let us shrewdly select our breeding stock from animals endowed with merit that have passed through a succession of noteworthy generations. As the first requisite for steady faithful work is a strong constitution, the sire should always be chosen with a view

to prepotent vitality. There are culls in all breeds, and the far-reaching influence of a scrubby, ill conditioned male may prove disastrous to the health and stamina of future generations. Therefore too great thought and care cannot be given to the selection of the animal whose off-spring will contain fifty per cent of his good or bad qualities.

Selection of the cow.—After the bull has been selected, look well to the characteristics of the mother. These mothers have a wondrous way of stamping their peculiarities upon their young—she should have proven, beyond question, her stability, and merit at the pail and churn, and, furthermore, if these good qualities have become solidly fixed through the transmission of many worthy ancestors on both sides, one will rarely be disappointed in the make-up and characteristics of the calf.

Care of the calf.—She said that as a rule at the age of three or four days the dairy calf should be separated from its mother, and in order to make the severing of maternal ties as humane as possible, the calf may be placed in a little pen partitioned off from one corner of the box stall, so arranged that it cannot reach the udder of the cow, while the mother will in no way be prevented from fondling it to her hearts content. She said that practical experience had shown that the best method of weaning the calf and teaching it to drink was to remove it from its mother directly after morning's meal with no attempt to feed it until evening. The cow may now be turned out to exercise and will undoubtedly return in a short time, nervous and anxious, but so soon as she realizes that no harm will befall her little one and that it is in the hands of kindly disposed friends she will, without further ado, quietly take her place among the workers, and, with intuitive confidence in the management, willingly entrust her daughter to the care of the herdsman, just as a loving human mother would place her child under the sole tutelage of some refined and accomplished instructor.

In the first place the durability of rugged constitution is an imperative requisite for the long and strong pull that must be demanded of a profitable dairy worker, and badly ventilated damp calf pens are not calculated to promote vigorous health and thrift. There is little doubt that humid and filthy quarters are responsible for at least one-third of the ailments of calf-hood. Over-feeding, too rich food, and irregularity in feeding may safely be credited with another third, while one-half if not three-fourths of the remainder of these

dependent creatures are debilitated from drinking from unclean pails, and the balance are victims of colds, thoughtless neglect, and well meant, but unskilled doctoring—for a calf's stomach is always weak in proportion to its body and requires rest rather than the over-taxing exertion of digesting various kinds of nostrums.

The calf should be placed in a roomy, dry, clean, and well littered stall free from draughts and currents of air and kept at as even a temperature as possible. For the latter reason it is not advisable to have the pens in winter located in a cow barn, where the cattle are turned out during the greater part of the day. The temperature of such a barn is largely controlled by the heat of the animal, and is therefore subject to sudden and marked changes.

It is wise to keep spring and summer calves stabled until two months old. Fall and winter calves are better for being kept indoors during the entire winter and early spring months, and no calf should at any time be compelled to occupy a pasture unprovided with abundant shade and shelter. From the day of its birth, a handful of clean bright hay should be offered as a temptation, and many a strong active calf has, when a few hours old, been found chewing the alluring bait. At the end of the first week one-half of its milk allowance may be skimmed, and at the end of the second week separator milk may be its only nourishment. For the first two weeks it is prudent to feed three times daily, from three pints to two quarts and *no more* at one time. The milk should never be given cold or luke warm. When feeding three times a day, six quarts are sufficient, but when the calf is put on two meals a day seven quarts evenly divided may usually be assimilated with good results. Never feed in wooden pails or troughs and be sure that the tin or earthenware receptacle containing the food is perfectly clean and sweet. Calf pails should be as often cleansed and scalded as milk pails. It is unnecessary to ever increase the quantity of milk, and if at any time the calf begins to scour, reduce the ration one-half. A raw egg or a table-spoon of uncooked corn starch added to the remainder will almost always correct the evil, and as the calf improves gradually increase to the full amount.

At an early age, from two to three weeks, the calf may be taught and should be encouraged to eat a small quantity of bran, whole oats, or any food containing a large amount of protein. A table spoon full of jelly made from well scalded old process oil meal added once a day to the milk will insure slick coats and prove beneficial to

digestion, but never on any account make the mistake of feeding a dairy animal fattening food. As the calf grows older it will require more liquid, and water may then be added to the milk, and a frequent drink of water, especially in the hot summer months, will be beneficial.

Endeavor to establish a habit of consuming large quantities of wholesome roughage, which will furnish considerable nourishment for the development of both brawn and size. While exercise and pure air are admirable factors in the development of stock, still young animals should never be exposed for any length of time to intense cold or sleety storm.

A yearling should have a regular stall, and will soon learn to know and take her place without prompting. If she has received the right kind of care and treatment her senses of terror will lie dormant and a gentle command from the herdsman will bring her fearlessly and readily to his side. The early maternity breeds should drop their first calves at from twenty-two to thirty months of age. For at least three months before calving a heifer should receive special attention. A daily grooming and gentle handling of the udder will in a great measure prepare and familiarize her with the process of milking. During this critical period it would be well for her to receive a moderate ration of grain. If pasture is insufficient, a soiling crop should supplement it, or if it be in winter a generous amount of cut corn fodder, clover hay, or any other good roughage, with the addition of a few roots, such as carrots and mangels, will make a satisfactory feed.

She asked that, now when this dairy worker stands ready to contribute her earnings to the dairyman's income, every advantage be given at the beginning of her producing period, because the regular habits formed during a heifer's first milking year will, to a great extent, mar or make the standard by which her future usefulness is to be measured.

In conclusion the speaker said:

"Now that you have bred her from the best milk producing strains, now that you have fed and cared for her with a view to improving her valuable qualities, when she secrets milk let it be your further duty to see that it is drawn from her at the proper time and that the udder is never over-taxed. Insist that she be milked three times a day whether she give much or little, for at least three months. If possibile, prolong the milking period until within four weeks of the time she is due to drop her second calf. Then, if with her

third freshing, she fail to meet the owners expectations, he has still the satisfaction of a duty well and faithfully performed, and be assured that every earnest effort in life will eventually meet with reward."

SOME DISEASES OF FARM ANIMALS AND HOW TO TREAT THEM.

Dr. J. C. Roberts, professor of veterinary science at the Agricultural College of Mississippi, in discussing some diseases of farm animals and how to treat them, first called attention to the need of State veterinary sanitary legislation. He said:

The twelfth census of the United States gives the total value of live stock in Mississippi as about fourty-two million dollars—over twenty-five per cent of the total value of our farm property. There is not a single statutory provision for their protection against preventable contagious diseases, save one concerning glanders. Many of the states have laws concerning the prevention and suppression of diseases of domestic animals and have in this way protected and encouraged their livestock industry. Virginia, North Carolina, South Carolina, Tennessee and Texas among the Southern States, have strict laws, on this subject, with State veterinarians and funds to enforce them, while Mississippi is a dumping ground for dire infectious maladies against which other states quarantine. The quarter of a million dollars lost by our State last summer from the one disease, anthrax, would be sufficient to pay all expenses of a Livestock Sanitary Board for more than twenty years.

As far as possible the College, through the Professor of Veterinary Science, has assisted in suppressing reported outbreaks of contagious diseases among farm animals in the State. This method of work, however, cannot possibly give the best results, since we have no assistant, and are without either legislation or funds to enforce suitable sanitary measures. As a preliminary to the consideration of a few of the many diseases to which domestic animals are subject, the Doctor said:

The animal body may be compared to a piece of delicate machinery consisting of eight different parts or systems. These parts if in normal condition and properly adjusted to each other constitute a healthy body. The integrity of the whole depends upon the state of health or disease of its parts. A feed of rotten corn may result in violent spasms of the small intestines (spasmodic colic) and

throw not only the digestive system, but the entire body into a state of nervous excitement, in like manner a ring bone or a bone spavin may render the horse practically useless for certain classes of work. If we had a perfect knowledge of the laws of health and obeyed them disease would be unknown. We can never hope for such an accurate knowledge of hygenic laws, but I do claim that by paying careful attention to the selection, care and management of our domestic animals that we can ward off many diseases, and thus add materially to the profits of the farm.

Cramp colic in horses and mules, (Remedy.)—Various drugsare recommended. A common and efficient drench is made of an ounce each of chloraform, laudanum, and ether added to a pint of warm water. Instead of this an ounce of chloral hydrate and one-half grain of sulphate of atropia may be given, added to a half pint af water. If the case is a very severe one we may give by means of a hypodermic needle from two to four grains of morphine. If we suspect the cause is from irritating food the above remedies should be given in a pint of raw linseed oil instead of in water. The flanks and abdomen should be rubbed with a strong liniment. Blankets may be wrung out in hot water and held against the abdomen during intervals of ease between the pains. The drenches may be repeated in three quarters of an hour if necessary.

Hoven in cattle.—The treatment for Hoven or wind colic in cattle should be preventive. Feed, salt, and water the cattle before turning them into a green pea or clover field. Allow them to remain on such pasture not longer than twenty or thirty minutes the first day and thus gradually become accustomed to the new diet. If the cow is only slightly bloated pull the tongue from side to side and cause her to belch the gas. Tieing a rope in the mouth, bridle fashion, causes chewing, which may be followed by belching of gas. By use of a mouth gag a three quarter inch rubber hose may be passed to the stomach and the gas thus allowed to escape. We have had good success with a drench composed of a handful of soda shaken up in a quart of lard oil. If the swelling interferes seriously with breathing we should make an opening directly into the first stomach of the cow and allow the gas to escape. The place selected for the opening should be in the left flank at a point equally distant from the last rib, hip bone and backbone. If no trocar and canular are at hand use the small blade of a sharp knife for making the opening.

Milk-fever.—This is a disease peculiar to the cow, occuring at or about the time of calving. It is seen only in well-fed, deep milkers, and usually not before the second or third calf. It seems to be caused by a poison formed in the udder that is absorbed into the blood and produces the disease. The first symptoms are nervousness and more or less excitement. These are followed by partial then complete paralysis. The cow lies upon the ground with head bent around to her flank or extended straight out. The eyeball is not moved when touched by the finger. The preventive treatment is to give scanty diet a few days before and after calving. Do not allow her to run on rich pasture during these few days.

The curative treatment is to inject into the udder from two to three drams of iodide of potash disolved in a quart of boiled water. The solution should be about body temperature. Remove all milk from the udder and syphone one fourth of this solution into each quarter by means of a milk-tube, rubber and funnel, or inject by means of a small syringe. First wash the udder and teats (especially the orifices) with warm water and some antiseptic. Rub the udder well so as to cause absorption of the potosh and then milk out in about an hour. This treatment, if used in time, will save about seventy-five per cent of the cases. Under no circumstances try to drench the cow in this disease.

Texas fever.—Tick fever, Texas fever, and bloody-murrain are terms applied to an infectious blood disease of cattle, and is caused by a microparasite. This germ is carried around by the common cow tick and in the blood of cattle that have had the disease and are immune from it. So far as is known the disease is transmitted in nature only by means of the cow-tick. It is usually mild in young calves, detected in them only by use of the thermometer and by microscopic examination of their blood. Should the calf become one or two years old before he comes in contact with the tick and then becomes grossly infected by them he will be very apt to die of tick fever. The treatment is to see that the ticks get on our young calves, and if the calf has become six months old or more without coming in contact with ticks, first vaccinate him. This vaccination and a fuller discussion of this disease can be found in Bulletin No. 73 of this Station, which see.

Blackleg.—This is an infectious disease peculiar to fat cattle, usually between the ages of six months and three years old. It is characterized by sudden lameness and swelling of the fore or hind quarters. The animal gets down, may be unable to rise, and as a rule he dies in from twelve to thirty-six hours after first noticed to be sick.

Upon removing the hide the swelling is seen to be black, contains clotted blood, and appears as if air had been blown into it. The treatment is to burn or deeply bury the carcass of every animal that dies of the disease, and vaccinate all the healthy cattle you have that are subject to it. Three days after they have been vaccinated they may be considered immune for that season from the disease.

Treatment for founder.—If the animal be shod, remove the shoes, soak the feet in hot water, then apply hot poultices. Keep the poultices hot by pouring on hot water every hour. Boiled turnips, bran or corn meal, and hot water makes a good poultice. Give drench of a pint of raw linseed oil, and give in drinking water one ounce of nitrate of potash every four hours as long as the fever is over 101 degrees and the pulse full and strong. Place the animal in a comfortable box stall with good bedding and induce him to lie down. In mild cases the animal may be stood in a stream of cold running water for two or three hours at a time if the weather permits.

Hooks, hollow-tail, etc.—In reply to a question as to whether there was such a disease as "hooks" in horses, the speaker said: Hooks, hollow-horn, hollow-tail and loss of cud are supposed diseases that never exist.

YEARLING SHORT-HORNS INOCULATED AGAINST TICK-FEVER FOR R. B. HARDY, TRINITY, MISS.

Through ignorance a barbarious practice is sometimes made of cutting out a little red triangular membrane on the inner corner of the eye of the horse.

This membrane is the washer of the eye to remove dirt and trash when they get into it, and hence should never be molested. The eye is subject to various diseases. In all acute diseases of this delicate organ the animal should be rested, the eye bathed several times daily with pure cold water, a dark triangular bandage placed over it, and once or twice daily a few drops of some mild eye wash injected into it, as fifteen grains of boric acid to one ounce of boiled water.

WHAT CHEMISTRY HAS DONE FOR THE FARMER.

Mr. W. R. Perkins, Assistant Chemist, Mississippi Agricultural Experiment Station, in discussing the above subject spoke in part as follows:

Agriculture had its origin in the fact that nature failed to supply man with all that he needed in the way of food and clothing. As man advanced in civilization his wants and needs very naturally multiplied and the artificial production of the required commodities became more urgent. Agriculture as a result has been the leading occupation of man for all ages." * * * * * * * * *

The Greeks and Romans were familiar with much in agriculture that has not been improved on. They were well acquainted with the value of manures, the best methods of drainage and tillage, and knew the importance of air and water in the soil. The North American Indians were acquainted with the use of manures and taught the first colonists how fo put fish under their corn and to thereby increase the yields two or three fold.

The principles underlying the growth of plants were not known a hundred years ago; yet, the farmer had reached a high degree of success in cultivating his soil. The belief up to that time was that the material composing the plant was taken up through the roots, and that sugar, starch, oil, etc., were important plant foods. It was believed that these materials as well as barnyard manure, fish and similar substances were taken into the plant and utilized in its growth just as an animal consumes and assimilates its food. Decayed organic matter or humus was regarded as the main plant food in natural soils. * * * *

During the first half of the century thousands of experiments were conducted by chemists to determine from what source plants obtained their food, the character of the food, how it entered the plant and how utilized. The first step was taken when the chemist

proved that the roots were not the only organs contributing to the nourishment of plants, but that 90 to 95 % of the material composing the plant was obtained from the carbonic acid of the atmosphere and from water and that all of the carbon was taken through the leaves and, besides the water, no plant food entered through the roots except the two or three per cent of mineral matter composing the ash, and the nitrogen. In 1840 Liebig, a German chemist, published a volume on agriculture in which was set forth the theory of plant nutrition and fertilization as he and others had worked it out and essentially as it is taught today. The science of agriculture may very properly be said to have had its origin at this time.

After the ground work of agriculture had been laid chemists began to inquire more minutely into the fertilizer requirements of soils and plants, and soon found that Nitrogen, Phosphoric Acid and Potash were the things most usually deficient in soils, and that needed to be supplied in fertilizers. The fertilizer business of today is based on this principle.

The Potash deposits of Germany, the Saltpetre deposits in South America and the Phosphate deposits in this and other countries had not been discovered. Chemists not only pointed out the value of these natural deposits of plant food, but devised means by which they could be manufactured into commercial products of known content of available plant food. By his assistance alone is it possible to enforce efficient fertilizer laws and thus protect the farmer in the purchase of his fertilizers. * * * * * *

Chemists have called attention to the loss of fertility to the farmer where the practice prevails of selling the crops without returning anything to the soil, as is almost the universal custom in this State. An analysis of different crops enables one to calculate the mineral plant food lost in this way. Experiments have demonstrated that the loss of nitrogen to the soil is more than double what is actually removed by the crop and that the destruction of humus in cultivated soils is very rapid and constant. This information has, in many instances, led to the adoption of a system of farming that tends to husband the fertility of the soil by selling only a finished commodity that not only brings a higher price, but takes very little mineral plant food from the farm. One instance is the practice of growing live stock to consume the forage crops on the farm and return a very large part of the fertility to the land. But to impress the fact that this feature is not properly appreciated, mention may be made of some seventy million dollars worth of plant food annually exported in the various raw materials sent to Europe and other countries.

The speaker also said that chemists had done much work on soils, that they had analyzed thousands of samples from which valuable conclusions had been reached as to the adaptability of different soils to growing various crops. By studying the conditions best suit-

ed to the growth of different crops it has been shown how desirable conditions may be controlled and also the best means of restoring worn soils to a atate of productiveness.

The study of the nitrogen supply for plants has required much time and labor. It has included a study of germ life or bacteria in the soil and their importance in the production of plants. The principal occurence of nitrogen is in the air and, without going into the details of the work for half a century on this subject, it was finally ascertained that certain plants under certain conditions can take their supply of nitrogen from the air. The plants that have this power belong to the family Leguminosale which includes such plants as beans, peas, clovers and vetches and the conditions necessary to their doing so is that certain bacteria or germs must be present in the soil. These bacteria cause the nodules commonly seen on the roots of leguminous plants and in their growth render atmospheric nitrogen available to the host plant. When the nodules are not found on the roots of the plants it is evidence that the necessary germs for their formation are absent from the soil. When planted in new sections of country the success or failure of such crops as alfalfa and vetches may depend entirely on the presence or absence of the proper germs in the soil to enable them to get their nitrogen from the air.

The speaker said that when we considered that nitrogen costs three times as much per pound as any other element in a fertilizer and that an acre of land grown in cowpeas, vetch or clover may be made to take as much nitrogen from the air as is contained in a ton of cottonseed meal or five or six tons of commercial fertilizer, we realize the great importance of these crops in helping to maintain and improve the fertility of our farms.

Mr. Perkins also spoke of the work that had been done on the feeding of animals whereby it had been learned that there are two main classes of nutrients: the one to furnish heat and other energy and the other, material for building up the muscular tissues of the body. To secure the best results in feeding a certain proportion of each class should be given the animal and that the amounts should vary with the kind of work being done or the object aimed at in feeding, whether in the dairy for milk and butter or in the feeding pen for beef or pork. By determining the relative value of feeds by analysis and feeding tests much valuable aid had been given the feeder. It has also been shown that 85% of the fertilizer value of the feeds may be returned to the land if provision is made to save all the manure from the animals fed.

Chemists have obtained much information from their work with dairy products. The composition of milk, butter and cheese is now thoroughly understood and the methods of handling and manufacture have been much improved. The Babcock milk tester puts within the reach of every farmer at small cost, means by which he may determine the amoumt of butter in his milk, thus enabling him to make an individual study of his cows and to ascertain the most profitable ones. The same machine enables the creameryman to detect any loses of butter fat in the skimming and churning of milk, all of which is necessary to the best success.

The speaker referred to the useful work that had been done for the benefit of those who manufacture sugar from sugar cane and stated that the whole sugar beet industry was based on the work of the chemist. He also referred to the work that had been done in the field of agricultural technology and mentioned the manufacture of glucose and starch and the by-products of such manufactures. In conclusion he said:

"Some of the questions claiming the attention of the agricultural chemists of this country at present are: the inspection and analysis of fertilizers and fertilizer materials; the examination of food and feeding stuffs for adulterations; the growing of sugar beets and the manufacture of sugar from them; the examination of soils and the availability of the plant food in soils and fertilizers; the analysis of feeding stuffs and the determination of their digestibility; the reclamation of alkali lands in the West and studies on almost every phase of plant growth.

The greater part of what has been said in this paper has very little practical bearing on the immediate needs and operations on a farm. The main hope has been to show that the great business of farming is intimately connected not only with chemistry but with several of the sciences and to impress the fact that the growing of plants; the supplying of plant food; the understanding of the parts played by the soil and water; and various other problems that have to do with the management of a farm are all dependent on nature's laws, the explanation of which comes within the province of the scientist. And science is nothing but the learning of truth and the explanation of causes that produce effects.

Nature does most in growing crops and requires very little assistance in making good yields on rich land as a general thing. An understanding of the underlying principles enables man to supplement the deficiences of nature. The result of this understanding of the facts and putting them into practice will not only lead to better farming with greater profits but will impress the farmer that he is engaged in a business that requires a high degree of intelligence for its successful management.

MISSISSIPPI AGRICULTURE AS VIEWED BY AN OUTSIDER.

Dr. H. E. Stockbridge, Agriculturist of Florida Experiment Station, who for several weeks had been engaged in institute work in Mississippi, said that he really objected to being considered an outsider; that having seen so much of the State, and having been so kindly received by the people he had come to feel at home to such an extent as to be disposed to criticise Mississippi agriculture as a member of the family rather than as a mere cursory observer. Having been assigned a subject not of his choosing, the speaker said that he would endeavor to comply with requirements. Speaking of the lines along which changes might possibly be effected with advantage to the farmers of the State he proceeded to notice those which he deemed worthy of special consideration, grouping them, as indicated below in five sections:

I. THE VARIETY OF CONDITIONS AND INTERESTS.

The speaker said that Mississippi agriculture may be anything between the extremes of apple growing in the Blue Ridge and rice making on the inundated lands of the coast. The variety of soils and plants are almost as great as that of geographical location; yet with an extremely varied crop adaptation one is surprised to find that the agriculture of the State from north to south, east to west, from the sandy pine lands to the rocky hillside, from the delta to the corn and cotton fields of East Mississippi, is typical of but comparatively few crops. The natural inference is that agriculture in the State might be far more varied in character, and that the farmers throughout the State have to a great degree failed to take advantage of natural conditions. It is a surprising fact that the farmers are interested in but one great staple crop, to which their time and fortunes are almost wholly devoted. This condition demonstrates the necessity for a change in the general character of Mississippi agriculture, and suggests the second division of the subject.

II. THE LACK OF DIVERSIFICATION OF CROPS.

The speaker made the statement that if diversification of industries was essential to national prosperity, diversification of crops must be

equally indispensable to the continued highest success in agriculture. It is true that social, labor, and transportation conditions render dependence upon cotton as the chief money crop unavoidable. There are, however, certain sections of the State much better adapted to this crop than are others. Reason dictates that in sections possessing special advantages for cotton culture this crop should predominate, but where cotton is produced under comparative disadvantages some other crop or crops should take its place.

The speaker made the assertion that Mississippi farmers are not growing cotton from choice, nor beceuse of some irresistable attractions in the business, nor yet because they believe that their lands are better adapted to cotton than to other crops. No matter how adverse the conditions there is always a constant demand and a ready cash sale for cotton. Mississippi cotton farmers are cotton growers mainly because to them no other crop has, heretofore, presented itself which, year after year, could compete with it as a ready cash crop. Could they be convinced that other crops are better adapted than cotton to their soil and other conditions; that they offer with reasonable certainty moderate returns for their investment, they would turn with thankfulness to this hope in a new agriculture. Every farmer in Mississippi knows that sugar cane is perfectly adapted to the soil and climate of a considerable portion of the State. The speaker said that he had found here and there a patch for home consumption, but had failed to find a cane crop grown as a commercial undertaking. The reason for this condition is found, possibly, in the belief among farmers that its production involves too many conditions, too many uncertainties, or too much financial outlay to render results satisfactory.

The growing of cane for sugar production is a manufacturing rather than an agricultural problem, hence of little interest to the average Mississippi farmer, but because of the great and growing demand for healthful, palatable syrup such as can be produced from tropical sugar cane on most Mississippi farms and by any Mississippi farmer there is no reason why the production of a high priced syrup may not become an important industry in this State. One supposed obstacle in this business is based on the impression that the portion of the crop which must be reserved for seed is so large as to seriously diminish the possibilities of satisfactory financial returns.

A large part of the commercial cane crop of Louisiana and of the sugar cane crop of Florida and Georgia is pro-

duced from the green tips or tops which the Mississippi farmers invariably throw away. The best seed in the entire plant is found in these tips. In preserving the tips for seed carefully cut them from the portion intended for syrup and bed them for winter preservation exactly as ordinary seed cane is pre served, the only precaution being that the ground where the seed bed is made should be thoroughly pulverized and the butts of the tops carefully thrust into the mellow soil to the depth of about two inches, and then cover with litter or pine straw and then with sufficient soil to keep out frost, exactly as in the case of ordinary seed cane. Another obstacle which has deterred many from the cultivation of cane for syrup making has been the difficulty of preserving the syrup as well as its tendency to deteriorate by sugaring. Fermentation is the cause of the first difficulty and the natural crystalization of the sugar present causes the second. Both are easily and effectively prevented. Fermentation, whether occuring in syrup or any other fluid, is the result of the development of living germs. The process is rendered impossible by the destruction of these germs. Heat effectively accomplishes this. The germs of fermentation however exist at all times in the air, so effective preservation necessitates the exclusion of the air. This is easily accomplished by sealing the receptacles containing the syrup while the latter is hot. Bottles and jugs may be used for this purpose when the product is intended for home consumption, but for market purposes the tin can is the only practical syrup package and should be insisted upon as absolutely indispensable to securing high prices, which may be expected from a superior product. The character of the product will depend chiefly upon its purity. Cane juice, like all vegetable juices, contains coloring matter and other impurities which must be removed if first-class syrup is expected. The best means for accomplishing this removal is the straining of the juice as it comes from the mill through a filter made of common Spanish moss. The simplest device for this, now practiced by cane growers all over the South, is the mere straining of the juice through a common crocus sack. The moss filter is as simple however as the sack and the moss not only removes coloring matter and impurities but to some extent the causes of fermentation, so that syrup made in this way is not only better in quality but keeps longer than that produced by any other simple and practical method. The filter consists simply of a square box made of plank and as long as is possible, allowing the box to be set under the spout of the mill. The box is packed full of the black moss which

by natural or artificial means has shed its outer gray covering and is in a condition known commercially as upholstery or mattress moss. The box is packed as solidly as possible. The juice flows from the mill into the top of the filter, percolates through the moss and flows out at the bottom through a pipe that leads to the kettle or the evaporator. Sufficient moss should be prepared to fill the box twice. At the end of the first day's run the moss should be removed, thoroughly washed and sunned for a day, during which time the second filling of moss should be in use. Moss sufficient to fiill the filter twice is enough for the making up of two acres of cane and the product thus obtained is superior to and brings better prices in the market than that resulting from any other practical method. The crystalizing or sugaring of the syrup with time is easily prevented by the addition to the finished syrup while hot of from four to eight drops of concentrated sulphuric acid for each gallon of syrup, the result being inversion of the sugar or its conversion into non-crystallizable form, so that the formation of sugar crystals in the receptacles is utterly impossible. The quantity of acid used in no way affects the character or quality of the syrup.

The speaker said that there were other crops that the farmers might profitably grow. Fruit growing should become the main reliance in certain sections of the State and truck growing both for ths Northern and New Orleans market, is destined to become an important industry in the pine lands of South Mississippi. Particular attention should be given to the material advantages of parts of Mississippi for the successful development of the live stock industry. As a rule, the cotton grower has eliminated this feature entirely from his calculation, and he not only produces his crop upon corn and meat imported from the West, but has actually fertilized his fields with animal fertilizers obtained from Western slaughter houses, the product of cattle fattened upon material produced in his own cotton field. And yet the Mississippi farmer who is practicing this system of self-robbery is surrounded by conditions which, if properly utilized, would make him the most successful husbandman in the world and his State one of the centers of the great American live stock industry. Mississippi's native grasses, leguminous, and other forage crops and cotton-seed by-products give her the cheapest cattle food in the world and climatic conditions enable us to more economically utilize these raw products. The feeding period in the corn belt is from 120 to 150 days while in the Gulf States under identical conditions of care and feeding, the same results are obtained

in a period of from 60 to 90 days, so the outlay in time, cost of food, and the interest on the investment is only one-half as much in Mississippi as in Iowa. If thousands of cattle are fed in Iowa and money made on them under the adverse conditions there existing, what might reasonably be expected from the business here if conducted with the same degree of care and skill?

III. THE FAILURE OF THE FARMERS TO PRACTICE SCIENTIFIC AGRICULTURE.

The speaker said that among Mississippi farmers there was a very general disregard for the fundamental principles upon which successful agriculture depends. Referring to treatment given crops during periods of drouth, he explained how water on which the plants depend for life, coming originally as rainfall always acts in accordance with known laws; that direct rainfall furnishes but a comparative small portion of water absorbed by plant roots; that by far the greater portion appropriated by the plant comes from the permanent waters of the soil and is carried up by capillary attraction until it reaches the surface, that this upward movement is constantly in progress except during times of actual rainfall, and that during a drouth the water brought to the surface by capillary action is wasted by evaporation to the detriment of the growing crop unless checked by cultivation or stiring the surface soil. This cultivation of the surface soil causes evaporation to cease; the permanent supply of water is conserved; the needs of the crop supplied; and serious suffering from drouth is prevented. While these are established facts, practiced by thousands of farmers throughout the length and breadth of this land, the speaker said that he had found only here and there a Mississippi farmer utilizing these established principles. So universal are the applications of these facts that it has been quite possible in visiting the different sections of this State to determine from the crops themselves the character of the cultivation given. Another illustration of the disregard for scientific principles: The season has been marked by on unprecedented prevalence of cotton rust. Although it is a well recognized fact that kainit at the rate of 200 pounds to the acre or muriate of patash at the rate of 50 pounds

to the acre applied as a fertilizer has proven almost a certain specific against cotton rust, the great majority of farmers in affected sections have either been ignorant of the possibilities or they have failed to profit by the knowledge they possess.

IV. THE IGNORANT CONDITION OF FARM LABOR.

The speaker said that he wished it to be clearly understood that he referred to no exceptional condition, and certainly not to the Mississippi farmer himself. Not only in Mississippi but in every other cotton growing State every white Southern farmer is only too well aware of the fact that upon the negro, probably the most ignorant agricultural labor of any civilized country on earth, he is dependent for crop production and the success of his business. Remembering that throughout history, ancient and modern, the agriculture of a country has been the surest criterian by which to judge of its civilization, and that in the industrial success is proportional to the intelligence of the labor employed, it follows that American civilization must be measured by the condition of American agriculture, and that the ultimate success of American agriculture must inevitably depend upon the intelligence of the labor employed therein. The productiveness of the wheat fields of the prairie States and the success of the farmers cultivating them results largely from the intelligence which develops, produces and finally uses the improved implements of culture. On our Southern farms however, the tools and methods used today are essentially those of fifty years ago, and to the criticisms of such conditions the Southern farmer is prone to assert that "the nigger and the mule" admit of no other conditions. The negro farm labor must be made more familiar with the principles controlling the effectiveness of his labor. This does not necessarily mean more schooling, so-called, but that he must be practically educated for the business of crop production. Southern agriculture is struggling under an incubus with which it must continue to struggle in vain until this is accomplished.

V. THE EVIDENT INFLUENCE OF THE STATE AGRICULTURAL COLLEGE ON MISSISSIPPI AGRICULTURE.

Dr. Stockbridge spoke of the forcible evidences he had noted of the great influence for good which the College and Station have exerted, and the good fellowship apparently existing between these institutes and the progressive farmers of the State.

In conclusion the speaker said:

"It is a fact that however great may be the recognition given to improved methods, to scientific agriculture and to agricultural investigation, there still exists among the farmers in many portions of the country a tendency to scoff at what is known as 'book farming' and to manifest skepticism toward the possibilities of agricultural education or investigation as related to practical achievement on the farm. I find however that these conditions exist in Mississippi to a less degree than in any other Southern State; that leading farmers everywhere reeognize the sincerity of the effort on the part of the College authorities, and recognize the harmony of interest existing between the farmer and the farmer's college. I have been surprised to find that everywhere the relation between the Institute and the Institution has been emphasized, that the attention of the farmer has been constantly called to the fact that the Institute in which he was interested was simply one of the many phases of the agricultural work of the College. I must admit that in my own State I would not have dared to adopt similar methods. I would have believed it necessary in many places to have even minimized the connection between Institute and College, and I wish to congratulate both the Mississippi Agricultural College and the farmers that they have reached a condition where the suspicion of the one by the other has vanished and the actual dependence of the one upon the other is fully recognized I cannot but believe that this auspicious circumstance is evidence of the fact that for years the Mississippi Agricultural College has been distinctly agricultural in character. I should allude to a single criticism of the College which has occasionally presented itself; namely, that many of the students failed to become farmers upon completion of its courses. The reply to this criticism may perhaps be more appropriate in an outsider than in one actually engaged in the work here in your own State. Let me remind you that these colleges were not estabiseed and are not maintained by the General Government for the mere purpose of manufacturing farmers, however capable these farmers may be. The Law of Congress distinctly specifies that these institutions shall furnish "a liberal education for the several vocations and professions of life." Agriculture is therefore not made the only profession to the advancement of which these Colleges are dedicated; it is simply recognized as one of the great fundamental professions so

important to national welfare that national maintenance is justified. If the boys of the Mississippi Agricultural College fail to return to the farm I am certain that the responsibility for the fact must at least be divided and that the home influences to which the boy is subjected before he encounters the college influence is most responsible for these results. Notwithstanding this counter influence very many college boys have returned to Mississippi farms and are today engaged in the elevation of Mississippi farming."

Mississippi Agricultural Experiment Station.

BULLETIN No. 81.

THE COLORADO POTATO BEETLE.

BY

GLENN W. HERRICK.

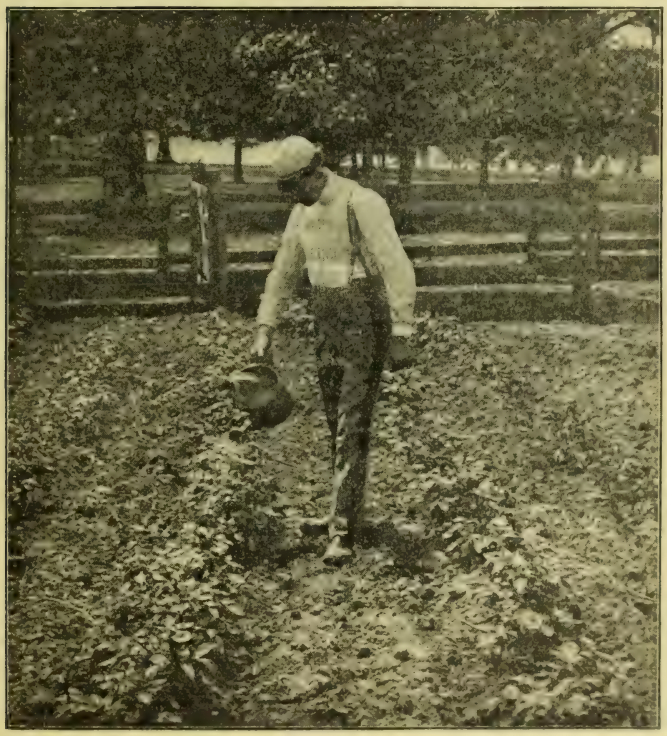


Fig. 1. Spraying Irish potatoes for the Colorado potato beetle with Paris green from a bucket sprinkler.

AGRICULTURAL COLLEGE, MISS.

JUNE, 1903.

MISSISSIPPI STATIONERY CO., YAZOO CITY

COLORADO POTATO BEETLE

(Doryphora 10-lineata.)

The Colorado potato beetle is the most serious enemy of Irish potatoes in this State. Yet it is an insect with which comparatively few farmers are acquainted. In former years this beetle had gradually extended in a southerly direction over the State until in 1897 it had reached the central portion. Since then, the truck growers and general farmers of the southern part of the State have for the first time experienced the ravages of this insect without knowing what it is or how to meet it. Although we shall, in the following pages, discuss the use and application of Paris green, the most universal insecticide for this beetle, we shall also discuss the results obtained from the use of arsenate of lead, a more recent, and in some respects a more desirable insecticide for the potato beetle.

Distribution of this insect:—It is interesting and instructive to note the progress of the Colorado potato beetle in its march over the State. In bulletin No. 41, of this station, a map was given showing the counties in which the beetle had been seen. Its southernmost limit at that time (1896) was Rankin and Hinds counties, south of the central portion of the State. Just six years after, in 1902, it was reported to me by a reliable and careful observer as an entirely new pest to potatoes in Ocean Springs on the Gulf Coast. We may safely say that this insect is now prevalent all over the State and must be reckoned with in the future wherever a crop of Irish potatoes is grown.

Life history and injuries:—The eggs of the Colorado potato beetle are nearly always laid in clusters on the under sides of the leaves of the potato plant. They are reddish orange in color and plainly visible to the unaided eye. (fig. 2, c).

We have noticed the larva of a certain lady bug feeding on both the eggs and grubs of the Colorado potato beetle. These lady bugs

and their larvae should be protected and allowed to live. An illustration of the larva and adult lady bug is given in figure 3.

In a few days the eggs hatch into small, soft, dark red, grub like creatures, known as larvae, that eat ravenously, grow rapidly and if left alone soon strip the stalks of leaves for it is these that do most injury to the plants. As these grubs grow they become somewhat lighter in color and each one has two rows of dark spots along either side of the body. (fig. 2, B). In two or three weeks they seem

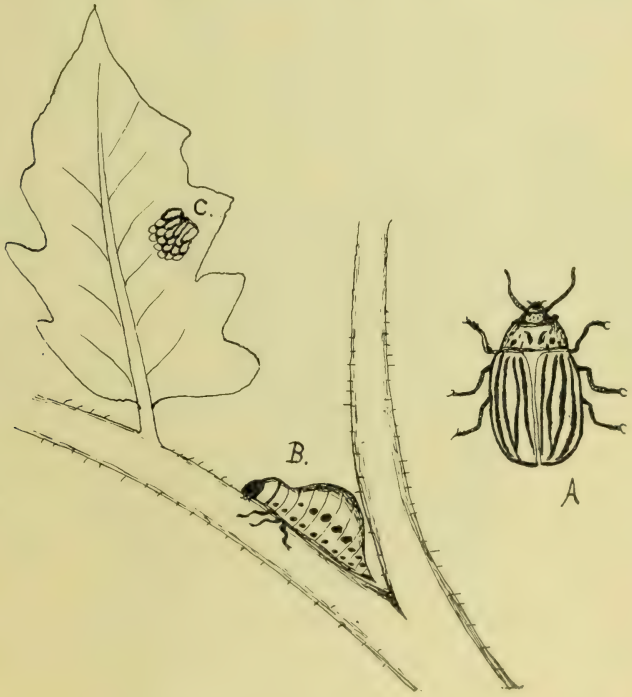


FIG. 2.—A, Colorado potato beetle; B, the grub or larva; C, the eggs,—all enlarged.

to have eaten and grown enough for they then leave the plants and enter the ground where they transform to what are known as pupae. At the end of about ten days they come forth from the ground as full grown, striped beetles, thus completing the life history.

The adult beetles are reddish yellow in color with five black stripes on each wing cover. The wing covers are hard, reminding one of a shell. The beetles are oval on top and are nearly one-half inch long. (fiig. 2, A).

FIG. 3.—Ladybug and larva, enemies of the potato beetle.

Remedies:—As both the larvae and adult beetles eat the leaves it is evident that they can be poisoned by an application of some arsenical poison to the leaves. Arsenical poisons are sold now-a-days under several different names. Perhaps Paris green is the most familiar form. Others are London purple, "Swift's Arsenate of lead," "Disparene," "Pink Arsenoid," etc. Out of all of these probably Paris Green is most universally used; but we believe it will be gradually supplanted, especially in combating the Colorado potato beetle, by arsenate of lead.

What arsenate of lead is:—It is a chemical combination of lead and arsenic. Its poisonous properties resides in the arsenic just the same as does those of Paris green.

Advantages of arsenate of lead:—Arsenate of lead is more easily held in suspension in water than Paris green. It appears white on the leaves and hence there is not so much danger of skipping plants here and there as with Paris green Arsenate of lead sticks to the foliage much more tenaciously and consequently remains on the leaves in an effective condition much longer than Paris green. Finally, and perhaps most important of all, arsenate of lead will not burn the foliage, even though by a careless mistake a much stronger application be made than was intended.

Results from the use of arsenate of lead:—Last season on three-quarters of an acre of potatoes growing on the Horticultural grounds I used "Swift's Arsenate of Lead ' at the rate of four pounds to fifty gallons of water. Some of this was applied with a common hand bucket sprinkler and some with a knapsack sprayer and Bordeaux nozzle. Only one application was made and the beetles were effectually destroyed. The material stayed on the plant long enough to poison the young beetles that came from eggs that hatched after the arsenate of lead was applied. I doubt seriously if Paris green would have done this.

This season I treated the same amount of potatoes with "Dis-

parene," which is arsenate of lead. The beetles were in abundance as figure 4 shows. The plant shown in figure 4 was taken from this field. In this case the "Disparene" was applied with a knapsack sprayer and seneca nozzle. Only one application was made. The

FIG. 4.—Potato plant stripped of its leaves by the grubs of the potato beetle.

material clung tenaciously to the leaves, being plainly visible after two weeks, and having in the meantime passed through a rain storm of thirty-six hours duration. The one application proved sufficient for the season.

Methods of application:—There is but one way to apply the Arsenate of Lead and that is by the wet method. Paris green may be applied either dry or wet, but the wet method is preferred as the least expensive and least laborious and troublesome. It can also be applied more evenly by the wet method.

Methods of applying Paris green:—The simplest way to apply Paris green where only a small field of potatoes is concerned, say a garden patch, is by means of a hand bucket sprinkler, such as is shown in figures 1 and 5. With such a bucket, holding *two gallons* of water, a *rounded teaspoonful* of Paris green should be used to each

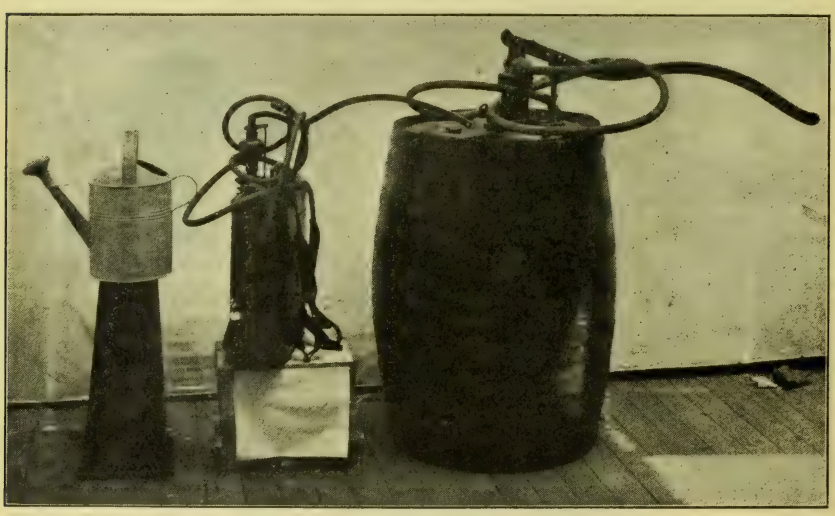


FIG. 5.—Bucket sprinkler, knapsack sprayer, and barrel sprayer.

bucketful. The poison should first be made into a thin paste in a little water and then stirred into the bucketful. It is *absolutely necessary* that the liquid in the bucket be agitated frequently with a long wooden paddle carried in the bucket for that purpose. If it is not frequently stirred the poison quickly settles to the bottom and the water at the top becomes too weak to be effective, while the water at the bottom becomes so strong that it burns the foliage. In applying the mixture one should walk at a natural pace along the row, for if one walks slow too much will be wasted. In fact, the objection to the use of a

hand sprinkler is, that it throws too coarse streams and wastes too much. To avoid this buy a bucket with as fine holes in the sprinkler as possible and walk fast if necessary.

A second method of applying this substance is by the use of a knapsack sprayer shown in figure 5. This costs from eight to ten dollars complete. It throws a fine spray, does not waste so much as the hand sprinkler and makes a more even application. Hence it is more desirable than the hand sprinkler.

A third method is by the use of a barrel sprayer (fig. 5). The barrel sprayer is more expensive than either of the above but is desirable where large fields of potatoes are grown.

Where Paris green is applied in large amounts it is used at the rate of *one pound* to 150 to 200 gallons of water with three or four pounds of quick lime added to prevent the poison from burning the foliage.

Methods of applying Arsenate of Lead:—Either "Swift's Arsenate of Lead" or "Disparane" may be applied in exactly the same manner and with the same apparatus as detailed above for applying Paris green.

Three to five pounds of "Disparane" to fifty gallons of water is the right proportion for the Colorado potato beetle. Two to three pounds of "Swift's Arsenate of Lead" to fifty gallons of water is the proportion given by the manufacturers. I used about four pounds to fifty gallons in the experiments here. No lime need be added to either of the above as there is no danger of burning the foliage. *Two to three ounces* of either "Disparene" or "Swift's Arsenate of Lead" to a *two-gallon bucketful* of water should be used if applied with a hand sprinkler.

Where to obtain these poisons:—The Paris green is for sale by most druggists, but is difficult to obtain unadulterated.

"Swift's Arsenate of Lead" is manufactured and sold by Wm. H. Swift & Co., Boston, Mass., and costs from 15 to 18 cents a pound depending upon the quantity purchased.

"Disparene" is manufactured and sold by the Bowker Chemical Co., 43 Chatham St., Boston, Mass., and costs 15 to 18 cents per pound.

An Arsenate of lead mixture may be made at home much more

cheaply than either of the above but involves some trouble. Dr. H. T. Fernald gives the following formula:

Arsenate of Soda (50 per cent strength)	4 oz.
Acetate of Lead	11 oz.
Water	150 gals.

"Put the arsenate of soda in two quarts of water in a wooden pail, and the acetate of lead in four quarts of water in another pail, also of wood. When the chemicals are all dissolved, pour the contents of both pails into the spraying tank with the rest of the water and stir for a few minutes before using."

Where to obtain spraying apparatus:—All kinds of spraying machinery is manufactured and sold by the following firms: The Deming Company, Salem, Ohio; The Goulds Manufacturing Co., Seneca Falls, New York, and the Field Force Pump Co., Elmira, New York. All of these firms are reliable and any of them will send their catalogue of spraying machinery, give prices and answer any questions asked.

Mississippi Agricultural Experiment Station.

BULLETIN No. 82.

INSPECTION AND ANALYSES OF COMMERCIAL FERTILIZERS

ON SALE IN THE STATE.

CHEMICAL LABORATORY.

AGRICULTURAL COLLEGE, MISS.
SEPTEMBER, 1903.

MISSISSIPPI STATIONERY CO., YAZOO CITY

MISSISSIPPI FERTILIZER CONTROL.

INSPECTION AND ANALYSES OF FERTILIZERS

BY THE CHEMICAL DEPARTMENT OF THE

Mississippi Agricultural & Mechanical College.

W. F. HAND ..... STATE CHEMIST

J. S. CARROLL ..... ASSISTANT CHEMIST.

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INSPECTION AND ANALYSES OF COMMERCIAL FERTILIZERS ON SALE IN THE STATE.

The analyses in the following pages show the composition of representative samples of the various brands of commercial fertilizers sold to the farmers of Mississippi during the season of 1902-1903. These samples were drawn by the regular fertilizer inspector from goods in the open market, and the more important brands have received the attention which their large sale demands. Inasmuch as a comparatively large percentage of the goods sold in this State is shipped out under only a few brand names, a very thorough inspection is made possible.

Buying on analysis.—*Low grade fertilizers.*—The fact that fertilizers and fertilizer materials can be intelligently and economically purchased only on the basis of their chemical composition, as shown by the analysis, is becoming more generally recognized each year. There are a number of grades of fertilizers on the market and a corresponding difference in price should exist between them. In other words, the analysis should determine the price.

Some manufacturers who make standard grade goods, and, who wish to continue to do so, have had occasion to complain recently that their products were being forced into competition with so-called *cheap* fertilizers. If *all* farmers knew how to buy, these cheap mixtures would not compete in any way with those of far better quality. Under the present conditions, however, a few farmers are almost sure to suffer imposition. If these low grade goods should find an extensive sale, all manufacturers would be forced to make and sell them in response to the demand. When farmers and dealers buy solely on the basis of the analysis, they are perhaps better protected in the purchase of their fertilizers than in almost anything they buy.

The difference in price that should exist between the standard and the low grade goods is brought out clearly in the example which follows: Analysis I. represents the average attained by the principal brands, and the result given under II. show the average compo-

sition of the low grade fertilizers. The table of analyses may be consulted for comparison.

	I. Approximate average composition of standard brands.	II. Approximate average composition of low grade mixtures.
Water-Soluble Phos. Acid	8.00 per cent.	8.00 per cent.
Citrate-Soluble Phos. Acid	2.00 "	2.00 "
Nitrogen	2.00 "	1.00 "
Potash	2.00 "	1.00 "
Relative value per ton	$18.97	$15.05

If a farmer can afford to give $15.00 for the low grade goods, he can pay $19.00 for the higher grade and feel that he has exercised good judgment. When a fertilizer is offered for a low price, an immediate inquiry should be made in regard to the quality shown by the analysis. The possibility of an unscrupulous dealer selling a low grade fertilizer for more than it is worth is at once apparent when the purchase is made without reference to the analysis.

Results of the inspection.—This bulletin contains the analyses of 262 samples, and, of this number, 28 or 10.68 per cent. are below the guarantee in one or more of the essential elements and also in the relative commercial value. One hundred analyses have been made since the appearance of circular No. 12, and sixteen were found below the analyses guaranteed by the manufacturers. The percentage of deficient samples is too large and a few manufacturers will certainly find it necessary to exercise more care in shipping out their goods.

The relative values calculated from the analyses entered under the following numbers are as much or more than one dollar per ton below the values calculated from the *guaranteed* analyses: Nos. 2954, 3280, 3338, 3345. In the table the guarantee for each brand is given, and, therefore, a comparison of all analyses with the proper guarantee may be made very readily.

Fertilizer valuations.—The following schedule of prices is adopted for calculating the relative commercial values given in this circular:

For Nitrogen	16¼c	per	pound
" Water-Soluble Phosphoric Acid in mixed goods	5½c	"	"
" Citrate-Soluble Phosphoric Acid in mixed goods	5c	"	"
" Water Soluble Phosphoric Acid in plain Acid Phosphate	5c	"	"
" Citrate-Soluble Phosphoric Acid in plain Acid Phosphate	4½c	"	"
" Total Phosphoric Acid in fine bone	3c	"	"
" Total Phosphoric Acid in medium and coarse bone	2½c	"	"
" Potash	5c	"	"

The actual calculation of the relative commercial values has been very frequently explained and the method is probably now well known by the most intelligent dealers. The percentages given in the tables represent pounds and fractions of a pound per hundred pounds of fertilizer. By applying the schedule of prices the value of 100 pounds and consequently of a ton is easily obtained.

Laboratory Number	Name of Brand and Manufacturer	Where and From Whom Collected
	Sold by A. D. ADAIR & McCARTY BROS., Atlanta, Ga.	
3072	Parish Furman Formula	Bomland & Robinson, Amory Guarantee
	AMERICAN GUANO CO., Nashville, Tenn	
3073	Mule Brand Acid Phosphate	W. E. Kelly, Pelehatchie Guarantee
3074	Mule Brand Am. Dis. Bone	W. E. Kelly, Pelehatchie Guarantee
3075	Mule Brand Blood and Bone Guano	W. W. Harris, Iuka Guarantee
3076	Mule Brand Cotton, Corn and Wheat Guano	M. D. Graham & Co., Forest Guarantee
3248	Mule Brand H. G. Dis. Bone	F. M. Howard, Canton Guarantee
	THE ARMOUR FERT. WORKS, Atlanta, Ga	
3249	Am. Dis. Bone and Potash	C. V. Akin, Decoto Guarantee
3077	Fertilizer No. 271	W. J. Hubbard, Shuqualak
3237	Fertilizer No. 271	R. F. Everett, Braxton Average Guarantee
3250	Fertilizer No. 282	M. J. Walker, Penrotoe Guarantee
	BIRMINGHAM FERTILIZER CO., Birmingham, Ala	
3078	Birmingham H. G. Fert.	Gilmore & May, Amory
3251	Birmingham H. G. Fert.	A. L. Myers, Caledonia Average Guarantee
	Sold by BLUMENFELD & FRIED, Ackerman, Miss.	
3245	B. & F.'s Own Mixture	Blumenfeld & Fried, Ackerman
3252	B. & F.'s Own Mixture	Blumenfeld & Fried, Ackerman
3252a	B. & F.'s Own Mixture	Blumenfeld & Fried, Ackerman Average Guarantee
	BROOKHAVEN PROGRESSIVE COTTON OIL CO., Brookhaven, Miss.	
3253	New South	Hartman Mer. Co., Brookhaven

Laboratory Number	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent			
3072	10.02	9.53	1.60	11.13	.26		2.37	$14.45
		7.00	*3.00*	*10.00*	*2.00*		*2.00*	*12.70*
3073	11.59	7.32	5.57	12.89	4.09			12.33
		8.00	*4.00*	*12.00*	*1.00*			*11.60*
3074	9.81	4.73	4.44	9.17	3.10	.83	.99	13.43
		7.00	*3.00*	*10.00*	*1.00*	*.82*	*1.00*	*14.27*
3075	9.74	7.10	4.85	11.95	2.17	1.12	.88	17.15
		6.00	*4.00*	*10.00*	*1.00*	*.82*	*1.00*	*14.27*
3076	11.10	5.12	3.85	8.97	2.94	1.77	1.38	16.62
		6.00	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*15.96*
3248	13.25	6.97	6.82	13.79	1.38			13.11
		10.00	*4.00*	*14.00*	*1.00*			*13.60*
3249	12.26	6.92	3.08	10.00	2.15	1.57	1.34	17.14
		7.00	*3.00*	*10.00*	*2.00*	*1.65*	*2.00*	*18.06*
3077	7.10	2.58	5.48	8.06	7.42	1.64	1.00	14.68
3137	7.83	2.96	4.93	7.89	6.58	1.60	.98	14.37
	7.46	**2.77**	**5.21**	**7.98**	**7.00**	**1.62**	**.99**	**14.51**
		5.00	*2.00*	*7.00*	*1.50*	*1.65*	*1.00*	*13.86*
3250	10.08	5.81	4.05	9.86	2.20	1.61	1.49	17.16
		5.50	*2.50*	*8.00*	*1.50*	*1.65*	*2.00*	*15.91*
3078	9.78	7.34	2.96	10.30	.83	1.70	2.10	18.66
3251	11.48	7.89	3.26	10.95	1.75	1.70	2.12	19.36
	10.63	**7.52**	**3.11**	**10.63**	**1.29**	**1.70**	**2.11**	**19.01**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*18.13*
2945	11.59	7.68	2.56	10.24	1.79	1.77	1.86	18.62
3252	13.81	7.01	1.62	8.63	1.78	1.85	2.09	17.43
3252a	11.05	7.43	3.45	10.88	1.57	1.75	1.77	19.08
	12.15	**7.37**	**2.54**	**9.91**	**1.71**	**1.79**	**1.91**	**18.38**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*18.16*
3253	9.78	7.24	2.47	9.71	1.06	1.81	2.73	19.05

Laboratory Number	Name of Brand and Manufacturer.	Where and From Whom Collected.
3319	New South	Brookhaven Progressive Cotton Oil Co., Brookhaven
		Average
		Guarantee
	CAPITAL FERT. & M'F'G CO., Jackson, Miss.	
3000	H. G. Acid Phosphate	N. B. Langford, Canton
3033	H. G. Acid Phosphate	Hyman Mer. Co., Summit
3254	H. G. Acid Phosphate	G. H. Banks, Forest
3255	H. G. Acid Phosphate	McMillan & Bolton, Newton
3256	H. G. Acid Phosphate	A. E. Kelly, Kosciusko
		Average
		Guarantee
3001	Mississippi Guano	Dunn Bros., Summit
3138	Mississippi Guano	Max Priebatsch, Brookhaven
		Average
		Guarantee
3002	Nonpareil	J. L. Moyse & Bro., Summit
3003	Nonpareil	Peets & Norman Co., Hazlehurst
3012	Nonpareil	Becker, Lyell & McGrath Co., Wesson
3079	Nonpareil	M. J. L. Hoye's Son, Newton
3139	Nonpareil	Mason Snowden, Woodville
3257	Nonpareil	Florence Mer. Co., Florence
3258	Nonpareil	Barnes, Ruffin & Co., Columbia
3259	Nonpareil	Stingily & Co., Pelahatchie
3260	Nonpareil	A. E. Kelly, Kosciusko
3261	Nonpareil	Lann & Carter H'dw. Co. Aberdeen
		Average
		Guarantee
3004	Red Star Brand Guano	S. Alcus, Summit
3034	Red Star Brand Guano	N. B. Langford, Canton
		Average
		Guarantee
3125	Our Vegetable Grower	I M. Eagan, Crystal Springs
		Guarantee
2933	German Kainit	Capital Fert. & M'f'g Co,, Jackson.
		Guarantee
	CONTINENTAL FERT. CO., Nashville, Tenn.	
3080	Sunny South Acid Phos.	A. L. Myers, Caledonia
		Guarantee
3262	Eddystone Cotton Guano	A. L. Myers, Caledonia
		Guarantee
3081	Eddystone Soluble Guano	A. L. Myers, Caledonia
		Guarantee

Laboratory Number	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3319	9.97	7.38	2.24	9.62	1.00	1.83	2.75	19.06
	9.87	**7.31**	**2.36**	**9.67**	**1.03**	**1.82**	**2.74**	**19.06**
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*1.80*	*16.86*
3000	9.48	10.40	3.20	13.60	.72			13.28
3033	9.65	8.85	4.02	12.87	.93			12.47
3254	10.70	8.42	3.50	11.92	1.01			11.57
3255	11.51	8.74	4.26	13.00	.59			12.57
3256	17.62	10.55	3.24	13.79	.63			13.47
	11.79	**9.39**	**3.64**	**13.03**	**.78**			**12.67**
		10.00	*2.00*	*12.00*				*11.80*
3001	10.62	6.68	3.32	10.00	.43	1.79	2.33	18 82
3138	12.04	7.10	2.70	9.70	.36	1.67	2.29	18.12
	11.33	**6.84**	**3.01**	**9.85**	**.39**	**1.73**	**2.31**	**18.47**
		7.00	*2 00*	*9.00*	*1.00*	*1.50*	*2.00*	*16.58*
3002	10.02	6.90	2 43	9.33	.46	1.71	2.48	18.06
3003	10.17	9.54	.83	10 37	.41	1.68	2 46	19.24
3012	10.12	7.74	2.89	10.63	.47	1.48	2.36	18.57
3079	11.03	6.91	2.97	9.88	.51	1.91	2.04	18.82
3139	11.53	7.70	1.82	9.52	.46	1.72	2.41	18.29
3257	11.22	6.55	2.85	9.40	.54	1.74	2.27	17 98
3258	14 81	5.45	4.60	10.05	3.31	1.52	2.13	17.67
3259	13.35	7.64	2.62	10.26	.37	1.51	2.50	18.53
3260	13.11	6 33	2.42	8.75	.33	1.76	2 44	17.54
3261	11 14	7.65	2.46	10.11	.41	1.82	3.39	20.18
	11.65	**7.24**	**2.59**	**9.83**	**.73**	**1.68**	**2.46**	**18.49**
		7.00	*2.00*	*9.00*	*1.00*	*1.50*	*2 00*	*16.58*
3004	10.24	7.06	3.35	10.41	.49	1.67	2.41	18.95
3034	10.53	7.29	2.72	10.01	.75	1.47	2.43	17.95
	10.38	**7.17**	**3.04**	**10.21**	**.62**	**1.57**	**2.42**	**18.45**
		7.00	*2 00*	*9.00*	*1.00*	*1.50*	*2.00*	*16 58*
3125	12.19	4.84	2.08	6.92	.63	2.65	5.76	21.78
		5.00	*2.00*	*7.00*	*1.00*	*2.50*	*3.50*	*19.13*
2933	2.72						13.54	13.54
							12.00	*12.00*
3080	13.30	9.72	3.41	13.13	1.07			12.79
		10.00	*3.00*	*13.00*	*1.00*			*12.70*
3262	7.70	7.05	3.09	10.14	.82	.92	1.05	14.89
		6.00	*4.00*	*10.00*	*1.00*	*.85*	*1.00*	*14.36*
3081	10.90	6.84	3.41	10.25	.87	1.41	1.10	16.62
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*1.00*	*16.06*

Laboratory Number	Name of Brand and Manufacturer.	Where and From Whom Collected.
	CRESCENT CITY STOCK YARD & SLAUGHTER HOUSE CO., New Orleans, La.	
2954	Crescent Ground Bone	Lotterhos & Huber, Crystal Springs
		Guarantee
	EAGLE COTTON OIL CO., Meridian, Miss.	
3140	Eagle H. G. Phosphate	J. K. Kirkland, Quitman
3141	Eagle H. G. Phosphate	C. V. Akin, DeSoto
		Average
		Guarantee
	FEDERAL CHEM. CO., Louisville, Ky.	
3082	Pure H. G. Acid Phosphate	E. M. & W. R. Cain, Caledonia
3142	Pure H. G. Acid Phosphate	Abney & Travis, Heidelberg
		Average
		Guarantee
3143	Standard Acid Phosphate	N. R. Hosey, Soso
3263	Standard Acid Phosphate	R. D. Hopper & Co., Tiplersville
		Average
		Guarantee
3083	St'd Acid Phos. with Potash No. 2	J. A. Goree, Columbus
3264	St'd Acid Phos. with Potash No. 2	R. D. Hopper & Co., Tiplersville
		Average
		Guarantee
3126	Daybreak Fertilizer	N. R. Hosey, Soso
3144	Daybreak Fertilizer	Abney & Travis, Heidelberg
3265	Daybreak Fertilizer	J. T. Furtick, Rienzi
		Average
		Guarantee
	HAZLEHURST OIL MILL & FERTILIZER CO., Hazlehurst, Miss.	
3035	H. G. Acid Phosphate	J. C. Harvey, Gallman
3128	H. G. Acid Phosphate	J. A. Parker & Co., Terry
		Average
		Guarantee
3005	Imperial Fertilizer	McComb City Mer. Co., McComb City
3006	Imperial Fertilizer	Hyman Mer. Co, Summit
3266	Imperial Fertilizer	J. R. Gillaspy, Crystal Springs
		Average
		Guarantee
3021	Superior Fertilizer	J. R. Gillaspy, Crystal Springs
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2954	5.30				23.48	3.58		23.38
					24.58	*4.20*		*25.94*
3140	15.36	10.40	3.14	13.54	1.34			13.23
3141	11.43	11.62	2.32	13.94	1.77			13.71
	13.39	**11.01**	**2.73**	**13.74**	**1.55**			**13.47**
		10.00	*4.00*	*14.00*				*13.60*
3082	13.06	10 96	2.65	13.6	3.30			13.35
3142	11 82	11.04	2.94	13.98	3.06			13.69
	12.44	**11.00**	**2.79**	**13.79**	**3.18**			**13.52**
		10.00	*4.00*	*14.00*				*13.60*
3143	13.97	9.51	3.49	13.00	2.88			12.65
3.63	12.55	7. 4	5.70	13.63	1.18			13 05
	13.26	**8.67**	**4.64**	**13.31**	**2.03**			**12.85**
		9 00	*3 00*	*12.00*				*11.70*
3083	13.10	7.60	3.05	10.65	2.53		2.01	13.42
3264	14.66	6.52	4.45	10 97	1.48		2.04	13.66
	13.88	**7.06**	**3.75**	**10.81**	**2.00**		**2.02**	**13.54**
		8.00	*2.00*	*10 00*			*2.00*	*12.80*
3126	11.67	7.19	3.03	10.22	3.34	1.78	1.62	18.34
3144	11.21	7.04	2.81	9.85	3.28	1.77	1.83	18 14
3265	9.36	6.61	3.27	9.88	2.70	1.63	1.55	17.39
	10.75	**6.95**	**3.03**	**9.98**	**3.11**	**1.73**	**1.66**	**17.96**
		6.00	*3.00*	*9.00*		*1.65*	*1 50*	*16.46*
3035	12.06	14.02	3.22	17.24	1.48			16.92
3128	12.82	12.61	3.67	16.28	2.26			15.91
	12.44	**13.31**	**3.45**	**16.76**	**1.87**			**16.42**
		12.00	*2.00*	*14.00*	*1.00*			*13.80*
3005	11.24	8.87	2 96	11.83	.97	1.87	1.88	20.67
3006	10.10	8.80	2.69	11.49	1.09	1.91	1.99	20.57
3266	11.08	8.14	1.31	9.45	.73	1 97	1.77	18 44
	10.80	**8.60**	**2.32**	**10.92**	**.93**	**1.92**	**1.88**	**19.89**
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*1.75*	*16.81*
3021	10.97	9.22	2.39	11.61	1.36	1.86	1.68	20.66
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.50*	*16.56*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	JACKSON FERTILIZER CO., Jackson, Miss.	
2931	H. G. Acid Phosphate	T. M. Steele, Forest
3022	H. G. Acid Phosphate	J. H. South, Florence
3085	H. G. Acid Phosphate	J. W. McKay, Waynesboro
3268	H. G. Acid Phosphate	Irving & Torbert, Wiers
		Average
		Guarantee
3267	Black Hawk Acid Phosphate	M. D. Graham & Co., Forest
		Guarantee
2948	Chicago R B. Superphos	Moody & Smith, Poplarville
3007	Chicago R. B. Superphos	Holmes Bros. McComb City
		Average
		Guarantee
3086	Gulf States Guano	T. B. Gaddis, Morton
		Guarantee
2936	Lampton's Am. R. B. Superphos	Lampton Mer. Co., Magnolia
2976	Lampton's Am. R. B. Superphos	The Lampton Co., Columbia
		Average
		Guarantee
3008	L. & H's Special Fertilizer	Lotterhos & Huber, Crystal Springs
		Guarantee
2946	Royal C. Brand	Wm. Atkinson & McDonald, Wesson
2947	Royal C. Brand	Potts-Jackson Co., Kosciusko
2979	Royal C Brand	W. H Chambliss & Son, Newton
3036	Royal C. Brand	Taylor Bros. & Nelson, Magee
3087	Royal C. Brand	J. M. Stephenson, Morton
3127	Royal C. Brand	J. P. Myer, Ellisville
3269	Royal C. Brand	A. B. Williamson & Co., Buckatunna
3270	Royal C. Brand	Centreville Mer. Co., Centreville
3271	Royal C. Brand	A. C. Seavy & Son, Brookhaven
3272	Royal C. Brand	H. A. Busick, Brandon
3273	Royal C. Brand	Irving & Torbert, Wiers
		Average
		Guarantee
2949	Vegetable and Fruit Fertili'r	Lotterhos & Huber, Crystal Springs
3037	Vegetable and Fruit Fertili'r	W. W. Alford, Gallman
		Average
		Guarantee
2950	Genuine German Kainit	Lotterhos & Huber, Crystal Springs
		Guarantee
	LAUREL OIL & FERT. CO., Laurel, Miss.	
3129	Laurel H G. Acid Phosphate	The T. B. Bonner Co., Laurel
3145	Laurel H. G. Acid Phosphate	T. M. Heidelberg & Son, Heidelberg

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2931	11.19	14.33	3.23	17.56	1.85			$17.24
3022	13.23	12.92	3.03	15.95	2.60			15.65
3085	11.89	12.86	3.26	16.12	2.52			15.79
3268	11.72	12 18	5.28	17.46	1.01			16.93
	12.01	**13.07**	**3.70**	**16.77**	**1.99**			**16.40**
		10.00	*2.00*	*12.00*	*1.00*			*11.80*
3267	11.57	9.58	5.11	14.69	1.77			14.18
		10.00	*2.00*	*12.00*	*1.00*			*11.80*
2948	10.81	6.82	2.91	9.73	3.54	1.66	2.08	17.89
3007	11.82	7.64	2.93	10.57	4.46	1 42	2.09	18.04
	11.31	**7.23**	**2.92**	**10.15**	**4.00**	**1.54**	**2.09**	**17.97**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*17 41*
3086	11.81	9.12	2.39	11.51	1.22	1.73	2.01	20.06
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*17 41*
2936	11.78	7.23	2.64	9.87	3.74	1.52	2.11	17.64
2976	11.51	7.34	3.74	11.08	3.79	1.50	1.99	18.68
	11.64	**7.28**	**3.19**	**10.47**	**3.76**	**1.51**	**2.05**	**18.16**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*17 41*
3008	9.83	7.37	2.70	10.07	1.14	2.18	3.46	21.35
		6.50	*2.00*	*8.50*	*1.00*	*2.00*	*2.30*	*17.95*
2946	11.65	9.19	2.49	11.68	1.45	1.71	2.04	20.20
2947	11.04	8.96	2.58	11.54	1.78	1.67	1.99	19.85
2979	10.03	8.48	1.73	10.21	1.85	1.70	1.88	18.46
3036	11.51	8.03	3.10	11.13	1 38	1.80	1.95	19.73
3087	13.08	8.64	2.23	10.87	1.92	1.75	1.87	19 29
3127	11.76	9.12	2.57	11.69	1.24	1.72	1.84	20.03
3269	10.78	8.68	2.85	11 53	1.29	1.83	1.89	20.24
3270	11.37	8 38	2.66	11.04	1.52	1.67	1.88	19 19
3271	11.95	8.62	2.30	10.92	1.28	1.83	1.86	19.59
3272	12.76	8.65	2.53	11.18	1.01	1.72	2.42	20.06
3273	11.23	8.44	3.11	11.55	1.33	1.69	1.79	19.68
	11.56	**8.65**	**2.56**	**11.21**	**1.46**	**1.73**	**1.95**	**19.66**
		7.50	*2 00*	*9.50*	*1.00*	*1.65*	*1.80*	*17.41*
2949	9.21	5.65	1.77	7.42	91	3.13	4.60	22.76
3037	9.76	5.12	1.97	7.09	.69	2.99	4.11	21 43
	9.50	**5.38**	**1.87**	**7.25**	**.80**	**3.06**	**4.36**	**22.09**
		3.00	*3 00*	*6.00*	*1.00*	*3.00*	*4.00*	*20.05*
2950	2.38						12.52	12 52
							12.00	12 00
3129	11.03	5.39	7 91	13.30	2.19			12 51
3145	9.11	10.40	5.69	16.09	1.00			15.52

Laboratory Number	Name of Brand and Manufacturer.	Where and From Whom Collected.
3274	Laurel H. G. Acid Phosphate	McLeod & Thornton, Pachuta
		Average
		Guarantee
3024	K. C. Mixture	F. E. Shivers, D'Lo
		Guarantee
3023	Plow Brand	J. W. Burnett, Braxton
3025	Plow Brand	W. T. Day, Mt. Olive
3130	Plow Brand	The Laurel Mer. Co., Laurel
3146	Plow Brand	M. H. Turner. Vossburg
3275	Plow Brand	The T. B. Bonner Co., Laurel
3276	Plow Brand	J. S. Eaton & Bro., Taylorsville
		Average
		Guarantee
	Sold by MARBACH & EAGAN, Crystal Springs, Miss.	
2944	Bat Guano	Lotterhos & Huber, Crystal Springs
		Guarantee
	MARIETTA FERTILIZER CO., Atlanta, Ga.	
3277	Dissolved Bone with Potash	J. A. Goree, Columbus
		Guarantee
3278	Royal Seal Guano	J. A. Goree, Columbus
		Guarantee
	MERIDIAN FERT. FACTORY, Meridian, Miss.	
3083	Meridian Eng. Acid Phos	A. E. Dalrymple & Co., Amory
3147	Meridian Eng. Acid Phos	W. L. Weems, Shubuta
3279	Meridian Eng. Acid Phos	I. H. Brown, Hickory
		Average
		Guarantee
2930	Meridian South'n Acid Phos.	W. H. Gallaspy, Hickory
3026	Meridian South'n Acid Phos.	Walker Durr Co., Mendenhall
3089	Meridian South'n Acid Phos.	Floyd Loper, Lake
3280	Meridian South'n Acid Phos.	Max Kahn, Gloster
		Average
		Guarantee
3090	Meridian Blood and Bone	Mathews & Cotton, Iuka
3148	Meridian Blood and Bone	McLain & Ratcliff, Gloster
3281	Meridian Blood and Bone	Leggett & Co , McHenry
		Average
		Guarantee
3027	Meridian Farmers' Friend	Gaddis & Slay Co., Magee
3149	Meridian Farmers' Friend	McLain & Ratcliff, Gloster
		Average
		Guarantee
2929	Meridian Home Mixture	W. B. Richardson, Newton
2953	Meridian Home Mixture	Seward & Gaston, Ackerman

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3274	9.40	7.83	7.16	14.99	2.29			14.27
	9.85	**7.87**	**6.92**	**14.79**	**1.83**			**14.10**
		10.00	*3.00*	*13.00*				*12.70*
3024	10.04	4.26	5.84	10.10	1.62	1.81	1.61	18.02
		7.00	*2.00*	*9.00*		*1.75*	*1.50*	*16.89*
3023	12.80	7.68	3.07	10.75	.78	1.82	1.93	19.36
3025	12.26	6.73	3 87	10.60	.86	1.72	1.83	18.69
3130	11.33	6.36	3.80	10.16	1.00	1.76	1.97	18.49
3146	9.17	7.22	3.09	10.31	1.00	1.84	1.80	18.81
3275	11.00	6.49	3.45	9.94	1.45	1.97	1.79	18.78
3276	10.46	6.40	2 92	9.32	1.55	1.96	1.67	18.00
	11.17	**6.81**	**3.37**	**10.18**	**1.11**	**1.84**	**1.83**	**18.68**
		7.00	*2.00*	*9.00*		*1.75*	*1.50*	*16.89*
2944	20.45				9.93	3.94	.73	18.50
					5.00	*4.25*	*.65*	*16.96*
3277	9.68	4.16	7.31	11.47	1.32		2.01	13.90
		6.00	*4.00*	*10.00*	*1.00*		*2.00*	*12.60*
3278	11.45	6.60	3.27	9.87	2.80	1.50	2.08	17.49
		6.00	*4.00*	*10.00*	*1.00*	*1.65*	*2.00*	*17.96*
3088	14.08	11.74	2.29	14.03	1.59			13.80
3147	14.23	11.36	3.00	14.36	1.20			14 06
3279	13.38	9.59	3.52	13.11	.72			12.76
	13.89	**10.89**	**2.94**	**13.83**	**1.17**			**13.54**
		10.00	*2 00*	*12.00*	*1.00*			*11.80*
2930	13.75	12.32	1.66	13.98	2 21			13.81
3026	13.29	11.73	2.12	13.85	2 05			13.64
3089	12.25	10.90	3.40	14.30	1.68			13.96
3280	12 61	10.76	1.81	12.57	1.52			12.39
	12.98	**11.43**	**2.25**	**13.68**	**1.86**			**13.45**
		12.00	*2.00*	*14.00*	*1.00*			*13.80*
3090	13.33	9 9	1.28	11.18	1.87	1.54	1.93	19 13
3148	13.02	8.92	1.54	10 46	2.56	1.60	1.96	18.51
3281	12.02	7.97	2 18	10.15	1.61	1.65	2.11	18.45
	12.79	**8.93**	**1.67**	**10.60**	**2.01**	**1 60**	**2.01**	**18.70**
		8 00	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*18.16*
3027	12.57	6.86	3.05	9.91	2.01	1.85	1 87	18.41
3149	9.66	7.55	2.65	10.20	3.21	1.10	2 14	16.67
	11.11	**7.20**	**2.85**	**10.05**	**2.61**	**1.46**	**2 01**	**17.54**
		8 00	*2.00*	*10.00*	*1.00*	*.85*	*1.00*	*14 56*
2929	12.98	7.74	2.48	10.22	1.33	1.75	2.24	18.92
2953	11.93	7.62	2.65	10.27	1.54	1.70	2.00	18.56

Laboratory Number	Name of Brand and Manufacturer.	Where and From Whom Collected.
2980	Meridian Home Mixture	John McGrath & Sons, Brookhaven
3038	Meridian Home Mixture	W. W. Pigford, Lumberton
3091	Meridian Home Mixture	Story & Smythe, Forest
3131	Meridian Home Mixture	McLeod-Kennedy Co., Hattiesburg
3282	Meridian Home Mixture	Mathews & Cotten, Iuka
3283	Meridian Home Mixture	J. D. Causy, Gloster
3284	Meridian Home Mixture	T. L. Cotten, Summit
3285	Meridian Home Mixture	Holloway & McRaney, Collins
3286	Meridian Home Mixture	Kennedy & Co., Wiggins
3287	Meridian Home Mixture	Wygul Bros., Nettleton
		Average
		Guarantee
3288	Meridian Soluble Guano	T. M. Steele, Forest
		Guarantee
3028	Meridian Vegetable Grower	W. H. Barron & Co., Crystal Springs
3092	Meridian Vegetable Grower	B. B. Davis, Buckatunna
		Average
		Guarantee
3039	Meridian German Kainit	W. H. Barron & Co., Crystal Springs
		Guarantee
	NATIONAL FERTILIZER CO., Nashville, Tenn.	
3093	National Acid Phosphate	W. A. Turner & Co., Forest
3095	National Acid Phosphate	E. M. & W. R. Cain, Caledonia
		Average
		Guarantee
3094	National Acid Phos. & Potash	E. M. & W. R. Cain, Caledonia
		Guarantee
3096	National Cotton, Corn and Wheat Guano	W. A. Turner & Co , Forest
		Guarantee
	NEW ORLEANS ACID & FERTILIZER CO , New Orleans, La.	
2951	Black Diamond Acid Phos.	Seward & Gaston, Ackerman
3013	Black Diamond Acid Phos.	Wm. Atkinson-Bacot Co., Osyka
3289	Black Diamond Acid Phos.	R. W. Carter, Iuka
3290	Black Diamond Acid Phos.	Robinson Mer. Co., Centreville
		Average
		Guarantee
3150	Crescent City Acid Phos	J. L. Moyse & Bro., Summit
3291	Crescent City Acid Phos	The T. B. Bonner Co., Laurel
		Average
		Guarantee
3009	Blood, Bone and Beef	J. L. Moyse & Bro., Summit
		Guarantee
2935	Blood, Bone and Potash	Louis Cohn & Bro., Brookhaven
3041	Blood, Bone and Potash	Philip Didlake, Star

Laboratory Number	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—PerCent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2980	9.93	7.38	3.71	11.09	1.39	1.64	2 07	19.23
3038	13.18	6.79	3.06	9.85	1.56	1.83	2.26	18.74
3091	14.25	6.91	2.80	9.71	1.77	1.95	2.13	18.87
3131	13.35	6.63	2.73	9.36	1.33	2.07	2.07	18.82
3282	12.45	6.77	2.52	9.29	1.80	1.79	2.02	17.81
3283	12.42	6.97	2 07	9.04	1.24	1.87	2.45	18.26
3284	14.32	6.69	2.19	8.88	1 73	1.84	2.42	17.95
3285	13.79	7.11	1.29	8.40	1.18	1.92	2.22	17.57
3286	14.05	6 83	1.64	8.47	1.52	2.11	2.18	18.19
3287	12.57	7.20	2.99	10.19	1.20	2.05	2.00	19.57
	12.93	**7.05**	**2.51**	**9.56**	**1.46**	**1.88**	**2.17**	**18.55**
		8.00	*2.00*	*10.00*	*1 00*	*1.65*	*2.00*	*18 16*
3288	12.20	8.25	1.85	10.10	1.20	1.87	2.06	19.06
		8.00	*2 00*	*10.00*	*1.00*	*1.65*	*2.00*	*18.16*
3028	10.47	5.69	2.29	7.98	1.60	2.36	7.07	23.29
3092	12.03	5.14	2.82	7.96	1.07	2.22	5.80	21.49
	11.25	**5.42**	**2.55**	**7.97**	**1.33**	**2.29**	**6.43**	**22.39**
		4.00	*2.00*	*6.00*	*1 00*	*2.50*	*6.00*	*20.53*
3039	2.62						12.08	12.08
							12.00	*12.00*
3093	13.03	7.73	8.11	15.84	1.48			15.03
3095	13.17	7.68	5.69	13 37	1.16			12.80
	13.10	**7.70**	**6.90**	**14.60**	**1.32**			**13.91**
		8.00	*4.00*	*12.00*	*1.00*			*11.60*
3094	12.35	6.42	6.55	12.97	.74		1.76	15.37
		7.00	*3.00*	*10.00*	*1.00*		*2.00*	*12.70*
3096	12.13	5.63	3.86	9.49	2.47	*1.88*	1.29	17.45
		6.00	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*15.96*
2951	11 68	11.83	2.85	14.68	2.90			14.40
3013	12.29	11.74	4.9	16.67	2.26			16.18
3289	11.78	12.27	2.05	14.32	3.17			14.12
3290	11.17	12.20	2.57	14.77	3.19			14 51
	11.73	**12.01**	**3.10**	**15.11**	**2.88**			**14.80**
		10.00	*2.00*	*12.00*	*2.00*			*11.80*
3150	10.53	13.18	2.12	15.30	4.04			15.09
3291	11.25	12.22	5.48	17.70	2.33			17.15
	10.89	**12.70**	**3.80**	**16.50**	**3.18**			**16.12**
		10.00	*2.00*	*12.00*	*2.00*			*11.80*
3009	11.45	8.90	2.32	11.22	3.67	1.86	1.24	19.40
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
2935	11.55	9.22	2.32	11.54	3.38	1.56	2.25	19 78
3041	11.95	8.53	2.20	10.73	3.25	1.84	1.50	19.06

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
3151	Blood, Bone and Potash	M H. Clayton, Heidelberg
		Average
		Guarantee
2934	Economizer	Louis Cohn & Bros., Brookhaven
2974	Economizer	Wm. Atkinson & McDonald, Wesson
3132	Economizer	D. H. Jones, Terry
		Average
		Guarantee
3097	Gold Dust	Rew & McClinton, Newton
3152	Gold Dust	M. H. Rothchild, Woodville
3292	Gold Dust	R. W. Fagan & Co., Waynesboro
		Average
		Guarantee
2932	Goldsmith's Imp. Mixture	Sones & Dansby, Forest
2952	Goldsmith's Imp. Mixture	W. M. Hyde & Co., Poplarville
2981	Goldsmith's Imp. Mixture	Seward & Gaston, Ackerman
3040	Goldsmith's Imp. Mixture	E. E. Bonner, Sandersville
3098	Goldsmith's Imp. Mixture	J. & B. McClenahan, Pelahatchie
3293	Goldsmith's Imp. mixture	Wm. Atkinson-Bacot Co., Osyka
3291	Goldsmith's Imp. Mixture	McHenry Mer. Co. McHenry
3295	Goldsmith's Imp. Mixture	Hawkins & Co., Hattiesburg
3296	Goldsmith's Imp. Mixture	K. Greene, Shuqualak
3297	Goldsmith's Imp. Mixture	Gilliland & Doty Co , Kosciusko
3298	Goldsmith's Imp. Mixture	Biloxi Milling Co., Biloxi
		Average
		Guarantee
3299	Jack Gaston's H. G. Cotton and Corn Fertilizer	Seward & Gaston, Ackerman
		Guarantee
3029	Vegetable Grower	J. C. Harvey, Gallman
		Guarantee
3153	Kainit	McComb City Mer. Co., McComb City
		Guarantee
	PLANTERS' FERT. M'F'G CO., New Orleans, La.	
3133	Planters' Cotton and Corn	E. R. Wilkinson, Poplarville
		Guarantee
	STANDARD GUANO AND CHEMICAL M'F'G CO., New Orleans, La.	
2939	Stern's Acid Phosphate	H. B. Lewis, Columbia
3014	Stern's Acid Phosphate	Magnolia Oil Mill & M'fg Co., M'gno'a
3099	Stern's Acid Phosphate	Dr. C. C. Ewing, Aberdeen
33 0	Stern's Acid Phosphate	Hyman Mer. Co., Summit
3301	Stern's Acid Phosphate	J. M. Kelly, Seminary
		Average
		Guarantee

Laboratory Number	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3151	11.60	8.01	2.52	10.53	4.23	1.60	1.65	18.18
	11.70	**8.58**	**2.35**	**10.93**	**3.62**	**1.67**	**1.80**	**19.01**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
2934	10.95	8.23	2.05	10.28	2.72	1.72	2.20	18.89
2974	8.57	8.76	1.42	10.18	2.90	1.71	2.44	19 05
3132	12.18	7.16	2.34	9.50	3.61	1.98	2 75	19.40
	10.53	**8.05**	**1.94**	**9.99**	**3.08**	**1.80**	**2.46**	**19.11**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*18.16*
3097	9.62	7.62	4.43	12.05	2.28	2.10	1.57	21.21
3152	12.02	6.79	3.87	10.66	2 20	2.24	1.82	20.44
3292	11.04	10.36	2.19	12.55	2.66	1.60	1.57	20.36
	10.89	**8.26**	**3.49**	**11.75**	**2.38**	**1.98**	**1.65**	**20.67**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
2932	10.43	7.42	3.93	11.35	2.17	1.78	1.54	19.42
2952	7.86	7.96	2.64	10.60	2.92	1.85	1.42	18 83
2981	9.23	9.77	3.11	12.88	3.15	1.77	1.78	21.39
3040	9.55	7.65	2.93	10.58	1.94	2.17	1.74	20.14
3098	11.09	6.97	2.82	9.79	2.70	1.95	1.54	18.37
3293	12.07	6.82	4.82	11.64	2.21	1.85	1.75	20.08
3294	11.10	7.70	2.30	10.00	2.96	1.97	1.92	19.09
3295	8.18	8.71	2.80	11.51	2.56	2.20	1.45	20.98
3296	13.78	5.83	4.18	10.01	1.70	2.32	1.73	19.86
3297	13.76	9.07	2.11	11.18	3.49	1.91	1.63	19 91
3298	10.50	6.70	2.89	9.59	2.60	2.49	1.40	19.75
	10.69	**7.69**	**3.14**	**10.83**	**2.58**	**2.02**	**1.63**	**19.80**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
3299	12.45	8.76	4.22	12.98	2.26	1.97	1.79	22.05
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
3029	10.28	6.40	2.98	9.38	1.57	3.04	2.75	22.65
		6.00	*1.25*	*7.25*	*2.00*	*2.80*	*2.60*	*19.55*
3153	2.14						12.36	12.36
							12.00	*12.00*
3133	10.29	6.23	2.68	8.91	1.59	1.52	1.42	15.89
		6.50	*2.50*	*9.00*	*2.00*	*1.65*	*1.00*	*16.01*
2939	14.07	10.96	4.17	15.13	1.91			14.71
3014	13.48	12.97	3.54	16.51	1.05			16.16
3099	7.78	10.44	5.71	16.15	1.52			15.58
3300	12.49	11.54	4.61	16.15	1.27			15.69
3301	15.15	11.51	4.46	15.97	2.20			15 52
	12.59	**11.49**	**4.49**	**15.98**	**1.59**			**15.53**
		10.00	*2.00*	*12.00*	*1.00*			*11.80*

Laboratory Number	Name of Brand and Manufacturer.	Where and From Whom Collected.
2940	Stern's Am. R. B. Superphos	C. Atkinson's Sons Co., Summit
2941	Stern's Am. R. B Superphos	The Lampton Co., Columbia
2977	Stern,s Am. R. B. Superphos	Smith & Ball Co., Columbia
3015	Stern's Am. R. B. Superphos	Wm. Atkinson & McDonald, Wesson
3100	Stern's Am. R. B. Superphos	L. C. Smith, Lauderdale
3306	Stern's Am. R. B. Superphos	Johnson-Woodward Co., Mt. Olive
3307	Stern's Am. R. B. Superphos	E R. Wilkinson, Poplarville
3308	Stern's Am. R. B. Superpho	J. A. Taylor & Son, Pelahatchie
3309	Stern's Am. R. B. Superphos	McLeod & Kennedy Co., Hattiesburg
3310	Stern's Am. R. B. Superphos	B. Stevens & Son, New Augusta
		Average
		Guarantee
2943	Blood, Bone and Meat	Hyman Mer. Co., Summit
3154	Blood, Bone and Meat	E. M. Carter & Co., Centreville
3302	Blood, Bone and Meat	L. Pittman & Co., Columbia
		Average
		Guarantee
2942	Champion Farmer's Choice	G. Lowenburg & Co., Kosciusko
2978	Champion Farmers' Choice	H. B. Lewis, Columbia
		Average
		Guarantee
2975	Mississippi Home Guano	The Lampton Co., Columbia
3042	Mississippi Home Guano	Ford & Eaton, Taylorsville
3303	Mississippi Home Guano	F. M. Brooks, Weathersby
3304	Mississippi Home Guano	Buckley Bros., Enterprise
3305	Mississippi Home Guano	J. S. Eaton & Bro., Taylorsville
		Average
		Guarantee
3084	Pelican R. B. Guano	Wm. Atkinson-Bacot Co., Osyka
3155	Pelican R. B. Guano	Wm. Atkinson & Son, Columbia
		Average
		Guarantee
3156	St'd Am. Soluble Guano	Dunn Bros., Summit
		Guarantee
2937	Ground Bone	Lampton Mar. Co., Magnolia
		Guarantee
3157	Kainit	Hyman Mer. Co., Summit
		Guarantee
	SWIFT FERTILIZER WORKS, Atlanta, Ga.,	
3311	Swift's Cotton Plant S. G. Guano	A. Batson, Bonds
		Guarantee
3312	Swift's Golden Harvest S. G. Guano	J. R. Dabbs & Bro., Guntown
		Guarantee
3158	Swift's Monarch H. G. Guano	Wethersbee & Higgins, Waynesboro
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
2940	13.51	6.91	3.37	10.28	2.55	1.49	1.43	17.24
2941	14.86	6.79	4.08	10.87	1.87	1.66	1.48	18.42
2977	11.80	6.86	2.81	9.67	2.12	1.56	1.54	16.97
3015	14.58	8.26	2.51	10.77	1.65	1.68	1.52	18.58
3100	11.08	6.31	4.46	10.77	2.75	1.36	1.39	17.21
3306	14.15	5.00	4.93	9.93	3.86	1.30	1.56	16.22
3307	14.11	5.28	4.38	9.66	3.44	1.47	1.74	16.71
3308	14.22	5.95	4.40	10.35	2.76	1.44	1.69	17.32
3309	12.72	6.03	4.38	10.41	2.75	1.45	1.56	17.29
3310	13.82	5.77	4.29	10.06	2.83	1.44	1.57	16.89
	13.48	**6.32**	**3.96**	**10.28**	**2.66**	**1.49**	**1.55**	**17.29**
		4.00	*5.00*	*9.00*	*1.00*	*1.65*	*1.50*	*16.26*
2943	12.27	5.76	2.44	8.20	3.86	1.92	2.47	17.49
3154	12.24	6.01	3.58	9.59	2.26	2.04	2.04	18.86
3302	12.37	5.99	3.78	9.77	1.19	1.73	2.06	18.05
	12.29	**5.92**	**3.27**	**9.19**	**2.44**	**1.90**	**2.19**	**18.14**
		4.00	*4.25*	*8.25*	*1.00*	*1.70*	*2.00*	*16.18*
2942	13.56	9.10	2.32	11.42	2.53	1.48	2.15	19.29
2978	11.05	7.09	1.77	8.86	2.65	1.52	1.79	16.30
	12.30	**8.09**	**2.05**	**10.14**	**2.59**	**1.50**	**1.97**	**17.79**
		4.00	*4.00*	*8.00*	*1.00*	*1.65*	*1.50*	*15.26*
2975	11.33	8.34	1.53	9.87	3.36	1.70	2.33	18.56
3042	13.93	8.80	2.86	11.66	1.98	1.43	2.13	19.32
3303	12.57	8.12	2.88	11.00	.86	1.82	2.48	20.21
3304	13.71	7.96	3.45	11.41	1.82	1.31	2.01	18.47
3305	7.85	6.98	3.35	10.33	4.45	2.19	2.50	20.65
	11.88	**8.04**	**2.81**	**10.85**	**2.49**	**1.69**	**2.29**	**19.44**
		5.00	*5.00*	*10.00*	*1.00*	*1.65*	*2.00*	*17.86*
3084	15.92	5.56	4.19	9.75	3.38	1.40	1.64	16.50
3155	9.59	5.56	4.48	10.04	3.57	1.31	1.50	16.35
	12.75	**5.56**	**4.33**	**9.89**	**3.47**	**1.36**	**1.57**	**16.43**
		4.00	*5.00*	*9.00*	*1.00*	*1.65*	*1.50*	*16.26*
3156	14.16	5.09	4.80	9.89	3.80	1.32	1.69	16.38
		4.00	*4.00*	*8.00*	*1.00*	*1.65*	*1.50*	*15.26*
1937	5.60				22.73	2.92		20.86
					18.50	*2.50*		*17.38*
3157	2.02						12.24	12.24
							12.00	*12.00*
3311	8.25	4.71	4.69	9.40	1.19	1.29	3.08	17.14
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*1.00*	*16.06*
3312	13.56	5.21	4.23	9.44	1.09	1.43	2.04	16.65
		6.00	*2.00*	*8.00*	*1.00*	*1.00*	*2.00*	*15.96*
3158	7.89	5.33	3.66	8.99	1.69	3.26	4.06	24.18
		6.00	*2.00*	*8.00*	*1.00*	*3.29*	*4.00*	*23.29*

Laboratory Number	Name of Brand and Manufacturer.	Where and From Whom Collected.
3313	Swift's Red Steer S.G. Guano	M. J. L. Hoye's Son, Newton
		Guarantee
	TENNESSEEE CHEMICAL CO., Nashville, Tenn.	
3030	Ox Acid Phosphate	N. R. Hosey, Soso
3314	Ox Acid Phosphate	Prather Bros., Baldwyn
		Average
		Guarantee
3159	Ox H. G. Dissolved Bone	T. J. Cotten, Summit
3315	Ox H. G. Dissolved Bone	W. H. Chambliss & Son, Newton
		Average
		Guarantee
3160	Ox H. G Ammoniated Bone	J. L. Bufkin & Son, Vossburg
3316	Ox H. G. Ammoniated Bone	J. E. Byrd, Mt. Olive
		Average
		Guarantee
3031	Ox Cotton Guano	A. M. Cross & Co., Enterprise
3102	Ox Cotton Guano	Hoye & Loper, Lake
3317	Ox Cotton Guano	S. L. Sanders, Corinth
3318	Ox Cotton Guano	A. L. Myers, Caledonia
		Average
		Guarantee
3320	Ox Potash Mixture	J. F. Shumaker, Rural Hill
		Guarantee
3321	Ox Slaughter House Bone	T. M. Holder, Burnsville
3322	Ox Slaughter House Bone	D. H. Ravisies, McLaurin
		Average
		Guarantee
	TENN. VALLEY FERT. CO., Florence, Ala.	
3103	King Cotton Grower	Bourland & Robinson, Amory
3323	King Cotton Grower	J. J. Rogers & Son, Tupelo
		Average
		Guarantee
	Sold by THREEFOOT BROS. & CO., Meridian, Miss.	
2927	Threefoot's H. G. Eng. Acid Phosphate	Threefoot Bros. & Co., Meridian
		Guarantee
2926	Prolific Acid Phosphate	Threefoot Bros. & Co., Meridian
3043	Prolific Acid Phosphate	Threefoot Bros. & Co., Meridian
3324	Prolific Acid Phosphate	J. A. Snowden, Hickory
		Average
		Guarantee
2925	Threefoot's Imp. Mixture	Threefoot Bros. & Co., Meridian
3104	Threefoot's Imp. Mixture	J. L. Wells, Hickory

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3313	8.57	5.46	2.62	8.08	.79	1.47	2.00	15.40
		6.00	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*15.96*
3030	12.53	9.63	2.83	12.46	.96			12.18
3314	10.90	6.93	5.16	12.09	1.10			11.57
	11.71	**8.28**	**3.99**	**12.27**	**1.03**			**11.87**
		7.00	*5.00*	*12.00*	*1.00*			11.50
3159	9.54	11.78	3.15	14.93	.43			14.62
3315	9.37	8.10	5.92	14.02	1.78			13.43
	9.45	**9.94**	**4.53**	**14.47**	**1.10**			**14.02**
		8.00	*6.00*	*14.00*	*1.00*			*13.40*
3160	8.65	10.14	1.13	11.27	2.80	1.58	2.06	19.48
3316	9.23	6.42	4.61	11.03	3.66	1.42	2.60	18.29
	8.94	**8.28**	**2.87**	**11.15**	**3.23**	**1.50**	**2.03**	**18.88**
		6.00	*4.00*	*10.00*	*1.00*	*1.65*	*2.00*	*17.96*
3031	10.38	8.38	3.10	11.48	1.43	1.55	1.28	18.64
3102	10.10	7.78	3.20	10.98	1.43	1.57	1.26	18.12
3317	7.92	6.50	4.09	10.59	3.67	1.57	1.21	17.55
3318	7.48	6.20	4.34	10.54	3.47	1.53	1.12	17.25
	8.97	**7.21**	**3.68**	**10.89**	**2.50**	**1.56**	**1.22**	**17.89**
		6.00	*4.00*	*10.00*	*1.00*	*1.65*	*1.00*	*16.96*
3320	10.35	3.99	7.10	11.09	9.63		2.01	13.50
		6.00	*4.00*	*10.00*	*1.00*		*2.00*	*12.60*
3321	8.17	4.67	5.46	10.13	.97	1.49	1.75	17.19
3322	9.15	4.35	4.83	9.18	4.14	1.40	1.81	15.98
	8.66	**4.51**	**5.14**	**9.65**	**2.55**	**1.45**	**1.78**	**16.59**
		6.00	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*15.96*
3103	13.60	7.88	3.85	11.73	2.62	.83	1.51	16.73
3323	11.47	5.18	4.57	9.75	3.04	1.09	1.46	15.27
	12.53	**6.53**	**4.21**	**10.74**	**2.83**	**.96**	**1.48**	**16.00**
		8.00	*2.00*	*10.00*	*2.15*	*.82*	*1.00*	*14.47*
2927	13.76	12.50	3.19	15.69	1.66			15.37
		13.00	*2.00*	*15.00*	*2.00*			*14.80*
2926	13.64	13.23	2.28	15.51	1.25			15.28
3043	11.96	11.72	3.41	15.13	1.80			14.79
3324	11.71	9.94	5.13	15.07	1.14			14.56
	12.44	**11.63**	**3.61**	**15.24**	**1.39**			**14.88**
		11.00	*2.00*	*13.00*	*2.00*			*12.80*
2925	12.34	7.34	2.56	9.90	1.79	1.70	2.07	18.23
3104	14.62	7.79	2.48	10.27	.90	1.91	2.31	19.57

Laboratory Number	Name of Brand and Manufacturer.	Where and From Whom Collected.
3325	Threefoot's Imp. Mixture	C. V. Akin, DeSoto
		Average
		Guarantee
	VIRGINIA-CAROLINA CHEMICAL CO., Memphis, Tenn.	
2956	Royal Acid Phosphate	H. A. Hearon, Jr., Ackerman
3010	Royal Acid Phosphate	J Niles Boyd, Kosciusko
3017	Royal Acid Phosphate	Donald Bros., Magee
3327	Royal Acid Phosphate	Lann & Carter H'dw. Co., Aberdeen
3328	Royal Acid Phosphate	T. M. Clark & Son, Verona
		Average
		Guarantee
2957	I. X. L. Acid Phosphate	Seward & Gaston, Ackerman
3044	I. X. L. Acid Phosphate	Winner & Meyer, Meridian
3105	I. X. L. Acid Phosphate	Barnett-Davis Supply Co., Boonville
3166	I. X. L. Acid Phosphate	C. Snow, Ackerman
3330	I. X. L. Acid Phosphate	I. N. Varnado, Osyka
		Average
		Guarantee
3326	Scott's H. G. Acid Phosphate	Rew & McClinton, Newton
		Guarantee
3161	Eclipse Soluble Guano	R. W. Fagan & Co, Waynesboro
		Guarantee
3106	Mobile Double Eagle Guano	T. L. Shots, Amory
3162	Mobile Double Eagle Guano	J. P. Wetherbee, Waynesboro
3331	Mobile Double Eagle Guano	J. R. Dabbs & Bro., Guntown
		Average
		Guarantee
2928	Mobile Standard Guano	Winner & Meyer, Meridian
2973	Mobile Standard Guano	H. A. Hearon, Jr., Ackerman
2945	Mobile Standard Guano	J. P. Myer, Ellisville
3163	Mobile Standard Guano	Buckley Bros. Enterprise
3332	Mobile Standard Guano	W. M. McGough, Morton
		Average
		Guarantee
3333	Royal Animal Bone	The W. C. Ellis Co., Magee
		Guarantee
3032	Royal Blood, Bone & Potash	Donald Bros. Magee
3334	Royal Blood, Bone & Potash	Clark & Co., Tupelo
		Average
		Guarantee
3135	Royal Cotton Boll Guano	Moody Bros. & Smith, Poplarville
3164	Royal Cotton Boll Guano	J. H. Rogers, Pachuta
3335	Royal Cotton Boll Guano	Parson, Moreton, Wentworth Co, Brookhaven
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3325	14.57	7.36	2.34	9.70	1.20	1.93	2.11	18.82
	13.84	**7.50**	**2.46**	**9.96**	**1.30**	**1.85**	**2.16**	**18.88**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*18.16*
2956	3.05	.96	12.92	13.88	1.54			12.59
3010	10.12	4.90	8.49	13.39	2.78			12.54
3017	9.70	5.77	7.53	13.30	2.81			12.55
3327	4.20	.78	12.58	13.36	2.03			12.10
3328	7.58	6.31	8.43	14.74	2.52			13.90
	6.93	**3.74**	**9.99**	**13.73**	**2.33**			**12.74**
		10.00	*2.00*	*12.00*	*2.00*			*11.80*
2957	11.50	11.56	2.87	14.43	2.96			14.14
3044	10.98	8.14	3.50	11.64	1.18			11.29
3105	9.49	2.48	11.00	13.48	2.33			12.38
3166	6.63	1.54	11.30	12.84	2.60			11.71
3330	11.30	9.76	6.66	16.42	.43			15.75
	9.98	**6.70**	**7.06**	**13.76**	**1.90**			**13.06**
		10.00	*2.00*	*12.00*	*2.00*			*11.80*
3326	13.12	10.53	3.93	14.46	1.57			14.07
		12.00	*2.00*	*14.00*	*2.00*			*13.80*
3161	14.55	7.01	3.27	10.28	.52	1.70	1.20	17.71
		6.00	*3.00*	*9.00*	*2.00*	*1.65*	*1.00*	*15.96*
3106	11.69	5.49	4.08	9.57	4.68	1.66	1.90	17.41
3162	14.39	8.70	2.11	10.81	.99	1.62	2.26	19.20
3331	10.31	7.38	3.71	11.09	1.00	1.64	2.56	19.72
	12.13	**7.19**	**3.30**	**10.49**	**2.22**	**1.64**	**2.24**	**18.78**
		7.00	*3.00*	*10.00*	*2.00*	*1.65*	*2.00*	*18.00*
2928	10.17	6.10	3.22	9.32	.52	1.75	2.29	17.91
2973	8.17	6.18	3.88	10.06	5.50	1.81	2.23	18.79
2945	14.28	7.87	2.05	9.92	1.50	1.65	2.31	18.38
3163	13.50	6.36	2.03	8.39	1.13	1.60	1.91	16.17
3332	10.67	7.14	3.40	10.54	2.29	1.75	2.01	18.95
	11.36	**6.73**	**2.92**	**9.65**	**2.19**	**1.71**	**2.16**	**18.04**
		7.00	*1.00*	*8.00*	*2.00*	*1.65*	*2.00*	*16.06*
3333	8.82	6.84	3.48	10.32	2.96	1.80	1.24	18.09
		6.00	*3.00*	*9.00*	*2.00*	*1.65*	*1.00*	*15.96*
3032	10.72	7.28	3.16	10.44	5.64	.95	1.07	15.35
3334	10.62	7.91	2.63	10.54	1.33	1.20	1.33	16.56
	10.67	**7.59**	**2.90**	**10.49**	**3.48**	**1.07**	**1.20**	**15.94**
		8.00	*2.00*	*10.00*	*2.00*	*.82*	*1.00*	*14.47*
3135	12.16	6.17	2.66	8.83	1.75	1.53	2.04	16.46
3164	12.83	7.05	2.85	9.90	2.89	1.49	1.76	17.21
3335	10.42	4.99	2.94	7.93	7.42	1.80	2.11	16.28
	11.80	**6.07**	**2.82**	**8.89**	**4.02**	**1.61**	**1.93**	**16.65**
		7.00	*1.00*	*8.00*	*2.00*	*1.65*	*2.00*	*16.06*

Laboratory Number	Name of Brand and Manufacturer.	Where and From Whom Collected.
3336	Royal Compound	Will H. Wood, Pontotoc
3337	Royal Compound	Lann & Carter H'dw. Co., Aberdeen
		Average
		Guarantee
3329	Royal Dissolved Bone	A. L. Myers, Caledonia
		Guarantee
3107	Royal H. G. Guano	McCullar & Co., Booneville
		Guarantee
3338	Royal Potash Compound	J. H. Lorick, Rienzi
		Guarantee
3339	Scott's Ammoniated Bone	J. E. Byrd, Mt. Olive
		Guarantee
3108	Scott's Gossypium Phospho	W. C. Peeler & Co., Booneville
3165	Scott,s Gossypium Phospho	E. L. Scott, Summit
3340	Scott's Gossypium Phospho	Donald Bros., Magee
3341	Scott's Gossypium Phospho	T. M. Clark & Son, Verona
3342	Scott's Gossypium Phospho	R. J. Shannon, Tiplersville
3343	Scott's Gossypium Phospho	J. D. Bryan, Nettleton
		Average
		Guarantee
3109	Scott's Meal Formula	L. L. Anderson, Shuqualak
3344	Scott's Meal Formula	Gilliland & Doty Co., Kosciusko
		Average
		Guarantee
3011	Scott's Potasso Phospho	J. Niles Boyd, Kosciusko
3345	Scott's Potasso Phospho	S. Grunewald, McCool
		Average
		Guarantee
3110	Scott's State Standard Guano	Mullins & Green, Amory
3134	Scott's State Standard Guano	Donnell, McIntyre, Gates Co., D'Lo
		Average
		Guarantee
3111	Genuine German Kainit	W. C. Peeler & Co., Booneville
		Guarantee
	WESSON COTTON OIL AND FERTILIZER CO., Wesson, Miss.	
3346	Mutual Friend Mixture	Wesson Cotton Oil & Fert. Co ,Wess'n
		Guarantee

Laboratory Number	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3336	10.86	.74	9.19	9.93	2.01		2.18	12.18
3337	9.15	1.10	9.33	10.43	1.47		2.31	12.85
	10.00	**.92**	**9.26**	**10.18**	**1.74**		**2.25**	**12.52**
		8.00	*2.00*	*10.00*	*2.00*		*2.00*	*12.80*
3329	11.67	9.81	5.06	14 87	.75			14.36
		12.00	*2.00*	*14.00*	*2.00*			*13.80*
3107	12.41	5.01	5.68	10.69	1.48	1.50	2.12	18.19
		7.00	*3.00*	*10.00*	*2.00*	*1.65*	*2.00*	*18.06*
3338	10.57	.93	8.68	9.61	2.10		4.00	13.70
		8.00	*2.00*	*10.00*	*2.00*		*4.00*	*14.80*
3339	9.85	7.80	3.48	11.28	1.68	1.14	1.15	16.92
		6.00	*3.00*	*9.00*	*2.00*	*1.65*	*1.00*	*15.96*
3108	11.58	6.60	4.09	10.69	1.71	1.72	1.68	18.62
3165	12.49	*7.11*	3.22	10.33	2.23	1.60	2.25	18.49
3340	9.03	2.65	6.43	9.08	2.75	1.77	2.03	17.13
3341	9.05	6.91	4.63	11.54	1.84	1.71	2.36	20.15
3342	9.00	6.29	4.00	10.29	1.29	1.81	2.31	19.11
3343	11.36	9.40	1.08	10.48	1.06	1.60	2.12	18.74
	10.42	**6.49**	**3.91**	**10.40**	**1.81**	**1.70**	**2.13**	**18.71**
		7.00	*3.00*	*10.00*	*2.00*	*1.65*	*2.00*	*18.06*
3109	14.08	7.29	2.38	9.67	1.32	.88	1.08	14.34
3344	8.17	3.15	8.32	11.47	1 39	1.02	1.31	16.41
	11.12	**5.22**	**5.35**	**10.57**	**1.35**	**.95**	**1.19**	**15.37**
		8.00	*2.00*	*10.00*	*2.00*	*.82*	*1.00*	*14 47*
3011	11 47	4 08	7.95	12.03	2.34		2.02	14.46
3345	13.32	.95	9.67	10.62	1 84		2.18	12.90
	12.39	**2.52**	**8.81**	**11.33**	**2.09**		**2.10**	**13.68**
		10.00	*2 00*	*12.00*	*2 00*		*2.00*	*15 00*
3110	10.53	7.13	2.03	9.16	.79	1.44	1.69	16.24
3134	9.63	3.88	5.31	9.19	1.88	1.72	2 43	17.60
	10.08	**5.50**	**3.67**	**9.17**	**1.33**	**1.58**	**2.06**	**16.92**
		7.00	*1.00*	*8.00*	*2.00*	*1.65*	*2.00*	*16.06*
3111	1.40						12.54	12.54
							12.00	*12.00*
3346	8.85	7 23	3.33	10.56	1.68	2.39	1.59	20.64
		7.00	*2.00*	*9.00*	*1.50*	*1.90*	*1.50*	*17.38*

Mississippi Agricultural Experiment Station.

BULLETIN No. 83.

REPORT OF WORK AT

McNEILL BRANCH STATION FOR 1903.

By E. B. FERRIS.

Fig. 1. Cassava. (One Hill.)

AGRICULTURAL COLLEGE, MISSISSIPPI, JANUARY, 1904.

SENTINEL PRINT, VAZOO CITY, MISS.

REPORT OF WORK AT

McNeill Branch Experiment Station for 1903.

Introduction.—Since the last report a great deal has been done to add to the convenience of the Station by outside help as well as through the regular channels. The Board of Supervisors of Pearl River county granted a public road in front of the farm and gave the money to bridge a deep ravine between the Station and the town of McNeill. This bridge is of incalculable help to the general public and especially to the Experiment Station. It is something more than four hundred feet long and thirty feet high, and by means of it we are enabled to reach the depot by going about one-third the distance required to be gone a year ago. The New Orleans and Northeastern Railroad has built a neat depot in McNeill and has shown a willingness to render every assistance possible to the Station work. They have run excursions here at greatly reduced rates on two different occasions to give the farmers along their line an opportunity to profit by the work in progress here.

General statement.—For the first two months of the year almost the entire time of the Station force was devoted to the completion of fences and to the clearing of new land. There is now a total of four miles of fence and there are seventy acres of the enclosed land in cultivation. Forty-five acres of this land have been freed of stumps and the balance is being cultivated with the larger stumps unremoved. A great deal has been done towards clearing the ninety acres in pasture.

All timber on this, suitable for firewood, has been cut and

sold and the logs and tree tops on about one-fourth of it have been gotten ready to pile and burn. For three months the Station employed ten laborers, while for the balance of the time four and five have done the work. This labor has all been brought from Starkville and vicinity.

All the Station lands in cultivation, needing such, have been protected from surface washing by means of terraces, while the roads through and in front of the farm have been nicely surfaced. This work has been done with plow and surface grader, the two serving all the purposes, on a small scale, of an expensive road machine.

The buildings have been improved by completing a new shed on one side of the barn; adding four porches to the four houses for laborers; and in fixing a dark room for photographic work in the Station residence, which enables us to make protographs of growing crops whenever necessary. A new well was dug near the barn for watering live stock and the barn lot of three acres was well sodded in bermuda grass. This grass has also been started in several other portions of the farm; and it is intended to sod the ninety acres in pasture as fast as it is cleared, and to supplement the grass with such crops as lespedeza, vetch, and bur clover.

A jack was kept two months during May and June and the two mares bred to him, one of which is apparently with foal. During the summer and fall a few hogs were bought and they have marketed peanuts and chufas to good advantage.

Cheap pork may be successfully grown in this section by utilizing such crops as rye, oats, rape, sorghum, cowpeas, peanuts, chufas, sweet potatoes and artichokes. Hereafter the Station will breed good hogs and will devote several acres of ground to growing crops to feed them.

Feeding steers.—The experiment last winter of feeding thirty steers, parked on five acres of land, was done at a loss, though the object of getting the manure on the land was successfully accomplished. The problem of watering this number of animals was a most difficult one, as the well furnished only a small part of that required and the balance had to be hauled from a branch one-half mile away.

Necessarily the cattle did not get the water they should have had. These cattle were placed on feed Nov. 5, and marketed Feb. 7, making a feeding period of ninety-four days. During this time

the twenty-eight steers marketed made a gain of 4,975 pounds, an average of about 1.9 pounds each per day. One steer died at Christmas, his death being attributed by local men to poison ivy, which he is supposed to have eaten while being driven to water. A second one was so badly hooked in the stock pens that the animal was condemned.

The thirty head cost delivered here $574.79 and the feed they actually ate, $402.50. The twenty-eight head that were sold, brought, on the New Orleans market, a net sum of $799.80, leaving a total loss of $177.49. Feed was very high, meal costing delivered $23.75 per ton and hulls $5.80. The price of cattle, too, had dropped nearly one cent a pound between the time of buying and that of selling.

The effects of the tramping of these cattle during all kinds of weather has not been at all injurious to the land. In fact, it seems to have improved its water-holding power, for corn growing here showed the effects of drought much less than that on unparked land. Results showing increase of crops due to this manure will be given under the headings of the several crops.

Weather.—The Station purchased a set of thermometers and a rain guage during the earlier part of the year and since that time daily observations of the weather have been taken. It will be seen that during spring and fall there was very little rain, which caused vegetables, in these seasons, to be considerably reduced in quality and quantity. The following table gives a summary of these records:

METEOROLOGICAL SUMMARY.

1903 Month	Temperature					Precipitation	
	Mean.	Mean Maximum.	Mean Minimum.	Maximum.	Minimum.	Number of Rainy Days.	Rainfall in Inches.
January					22		
February						16	16.01
March							
April	60.5	76	55	86	41	1	.05
May	71	80	63	92	48	4	1.38
June	76	87	66	97	54	9	4.39
July	80	90	71	98	62	14	11.05
August			72		66	17	8.01
September	76	89	64	96	50	4	1.65
October	68	81	55	91	36	6	.33
November	58	71	45	85	25	2	.59
December	49	62	36	78	24	6	4.74

Soils.—The soils on which the Station is located are representative of a good type of pine woods lands in this section of the State. During the summer of 1902 a competent man was employed to make a traverse map of a quadrangle extending five miles in every direction from McNeill. This was preparatory to having the United States Bureau of Soils send experts here to make a soil survey of the territory covered. At Christmas these gentlemen arrived and spent the month of January in going carefully over the soils, taking samples for chemical and physical analyses, and in getting a general idea of the character of the country. Their report has not yet been distributed, but should soon be ready, when it may be obtained by applying to the Department of Agriculture at Washington or through a representative in Congress.

The analyses following give the chemical and physical compositions of soil and subsoil in the Station's main experimental field:

Analyses of Soils Taken From Station Field.

Laboratory Number.	Character of Soil.	
Surface Soil	Chemical Analysis—Per cent.	Sulphur Trioxide.
.055		
Subsoil ----		
.055		
Surface Soil		Moisture.
4.450		
Subsoil ----		
.84		
Surface Soil		Volatile and Organic Matter.
4.50		
Subsoil ----		
3.58		
Surface Soil		Insoluble Matter.
85.28		
Subsoil ----		
86.42		
Surface Soil		Soluble Silica.
.051		
Subsoil ----		
.066		
Surface Soil		Iron and Aluminum Oxides.
4.80		
Subsoil ----		
7.83		
Surface Soil		Calcium Oxide (Lime)
.220		
Subsoil ----		
.170		
Surface Soil		Magnesium Oxide.
.162		
Subsoil ----		
.140		
Surface Soil		Phosphoric Acid.
.023		
Subsoil ----		
.017		
Surface Soil		Potash.
.142		
Subsoil ----		
.210		
Surface Soil	Physical Analysis—Per cent.	Sand.
53.44		
Subsoil ----		
48.78		
Surface Soil		Silt.
28.65		
Subsoil ----		
28.37		
Surface Soil		Fine Silt.
3.86		
Subsoil ----		
3.45		
Surface Soil		Clay.
5.40		
Subsoil ----		
14.92		

Fertilizers.—In all, there have been conducted here, during the past year, one hundred and seventy-eight tests to show the effects of different kinds and combinations of fertilizers under fruits, vegetables, and the staple crops. The most of these results will be reported in the following pages. The different kinds of fertilizers have of course been made by mixing together a few raw materials in many proportions. The analyses of these raw materials are reported in the tables below:

ANALYSES OF FERTILIZING MATERIALS.

Laboratory Number.	Name of Fertilizer.	Moisture.	Per Cent Phosphoric Acid.					Potash (K_2O)—Per Cent.	Nitrogen—Per cent.
			Water Soluble.	Citrate Soluble.	Available.	Insoluble.	Total.		
1622	Complete Fertilizer	13.30	7.41	2.51	9.92	1.38	11.30	2.08	1.72
1623	Acid Phosphate	13.38	9.93	3.28	13.21	1.89	15.10		
1624	Ground Bone	8.27					22.00		3.59
1625	Cottonseed Meal	10.23					2.43	1.25	7.14
1626	Muriate of Potash	6.48						44.86	
1627	Kainit	3.22						12.86	
1628	Dried Blood	11.63							13.07
1629	Nitrate of Soda	.66							14.25
1630	Lime and Acid Phosphate Mixture 1 to 4	9.86	0.00	7.95	7.95	3.63	11.58		

FRUITS AND VEGETABLES.

Strawberries.—The two and one-half acres planted in strawberries failed to bear much the first spring. This was largely due to the extremely hard rains of March, followed by the excessively dry weather of April and May. On this ground, tests are being made with 150 varieties. Notes have been taken on these varieties several times during the year and will serve as a guide in the selection of the most profitable kinds for this section. Ten tests have also been conducted to show the fertilizer requirements of the crop, but as the yields were so light, no records were kept. These same tests will be carried through another year. Since the cultivation of the crop began, after the picking season, the vines have grown remarkably well and have now almost completely matted the three and one-half foot rows on

which they were planted. They are all that could be desired at this time.

Peaches.—An orchard of one hundred trees is being used to test the fertilizer requirements of this crop. These have been divided into twenty plats of five trees each and fertilized in as many ways. One acre is devoted to peaches simply as a commercial crop and thirty-six varieties of two trees each are being grown to find the most suitable kinds for conditions here.

These trees have all grown remarkably well and have been very favorably commented upon by experts who have seen them.

The varieties of apples, pears, plums, pecans, figs and raspberries have all done fairly well.

Cabbage.—In January last one acre was set to cabbage of two varieties with plants raised here in cold frames. In the field five plats, of one-twentieth acre each, were used to test the fertilizer requirements of the crop. One-half acre, including the five plats, was set in early all-head plants which failed to mature heads on account of drought. The other half-acre was planted in Jersey Wakefield cabbage which, being earlier, made fair sized heads that sold readily on the local market.

SECOND CROP.—In the latter part of May, Mexican June corn was planted between the cabbage rows, the acre yielding 36 bushels of perfectly dry corn and 3,300 pounds of stover.

FALL CABBAGE.—In August about three-fourths acre of land was set in fall cabbage, using plants grown here. The cut worms destroyed two successive settings of these plants despite every effort to get rid of them by daily hand picking. After losing practically all plants by worms we sowed seed in the open field where the cabbage were to mature, intending to transplant such hills as had more than one healthy plant. These seed came up fairly well and the extreme drought covering practically the whole fall kept them at a standstill. A lot of tin cans have been gotten together and unsoldered and will be used hereafter to fasten around each plant to keep off the worms from the time the plants are set out until all danger from worms is past.

Irish potatoes.—During the latter part of January one and one half acres were planted in Irish potatoes. Seven tests, to show the fertilizer requirement, and three tests of varieties were made. These potatoes were a long time in the

ground before sprouting, but finally came up to a good stand. The weather conditions were so bad that they never gave promise of any considerable yield. The final gathering of the crop showed that there was practically no difference in the yield of any of these plats. The size of the crop had been determined almost entirely by the amount of moisture at the disposal of the plants.

SECOND CROP.—King's Improved Cotton was planted after potatoes and at one time gave promise of a fine yield, but the severe drought after the middle of September, and early frost caused it to be cut off considerably. The average production of this cotton was about 750 pounds of seed cotton per acre, there being a difference according to the way the potatoes had been fertilized.

Beans.—On March 19, one acre of land was planted to two varieties of beans and fertilized in ten different ways. A part of this land was left in its natural condition and a part had been parked with cattle while being fed on cottonseed products. In fertilizing this crop 1000 pounds of a mixture containing 3 per cent each of nitrogen and potash and 7 per cent of phosphoric acid has been taken as a unit application per acre. The crop gathered, was scarcely half the amount that might reasonably have been expected with good seasons. This land was given good preparation; the beans were planted in rows 2½ feet apart and were cultivated at frequent intervals. The table gives the amount of fertilizer used and the several dates on which the beans were picked, with the amount in pounds per plat and in bushels per acre.

Results With Beans.

Nuumber of Plat.	Amount of Fertilizer per one-tenth Acre Plat.	Variety of Bean.
Unparked (1) No F'rtlizr	No Fertilizer	Wardwell's Kidney Wax Improved Valentine
Unparked (2) N. P. K.	22.2 pounds Cottonseed Meal 11.1 pounds Dried Blood 45.2 pounds Acid Phosphate 21.8 pounds Kainit	Wardwell's Kidney Wax Improved Valentine
Unparked (3) N½ P. K	11.1 pounds Cottonseed Meal 5.5 pounds Dried Blood 47.5 pounds Acid Phosphate 23.4 pounds Kainit	Wardwell's Kidney Wax Improved Valentine
Unparked (4) N. P.	22.2 pounds Cottonseed Meal 11.1 pounds Dried Blood 45.2 pounds Acid Phosphate	Wardwell's Kidney Wax Improved Valentine
Parked (1) No F'rtlizr	No Fertilizer	Wardwell's Kidney Wax Improved Valentine
Parked (2) N. P. K.	22.2 pounds Cottonseed Meal 11.1 pounds Dried Blood 45.2 pounds Acid Phosphate 21.8 pounds Kainit	Wardwell's Kidney Wax Improved Valentine
Parked (3) N½ P K½	11.1 pounds Cottonseed Meal 5.5 pounds Dried Blood 47.6 pounds Acid Phosphate 10.9 pounds Kainit	Wardwell's Kidney Wax Improved Valentine
Parked (4) ½ (N P K)	11.1 pounds Cottonseed Meal 5.5 pounds Dried Blood 22.6 pounds Acid Phosphate 10.9 pounds Kainit	Wardwell's Kidney Wax Improved Valentine
Parked (5) N. P.	22.2 pounds Cottonseed Meal 11.1 pounds Dried Blood 45.2 pounds Acid Phosphate	Wardwell's Kidney Wax Improved Valentine
Parked (6) P.	50 pounds Acid Phosphate	Wardwell's Kidney Wax Improved Valentine

Results With Beans.

First Picking May 15th	Second Picking May 18th	Third Picking May 22nd	Fourth Picking May 27th	Fifth Picking June 1st	Sixth Picking June 29th	Total Pounds Per Plat	Total Bushels Per Acre
Pounds	Pounds	Pounds	Pounds	Pounds	Pounds		
11.7	4.4	3.6	3.0	4.0	9.0	35.7	23.8
2.5	9.7	5.0	4.7	3.3	17.2	42.4	28.3
15.0	9.4	13.3	14.0	18.8	9.4	79.9	53.3
3.6	7.2	16.6	17.2	18.0	29.0	91.0	60.7
20.5	11.1	9.4	16.1	8.3	10.0	75.4	50.3
12.8	13.3	18.0	21.7	10.5	15.5	91.8	61.2
24.7	15.5	18.3	24.0	11.7	10.0	104.2	69.8
14.0	19.0	18.3	25.0	11.1	22.2	109.6	73.1
16.0	13.2	11.0	16.0	12.0	11.0	79.2	52.8
9.9	13.7	11.5	17.0	8.8	23.6	84.5	56.3
16.6	11.7	18.8	28.8	20.0	12.8	108.7	72.5
2.2	8.8	16.1	26.1	21.7	16.6	91.5	61.0
23.3	19.4	17.2	40.5	18.8	7.7	126.9	84.6
11.7	22.7	40.5	44.4	8.8	16.1	144.2	96.1
31.6	15.0	20.5	27.2	13.8	23.8	131.9	87.9
8.3	25.0	17.2	27.2	14.4	27.7	119.8	79.9
28.8	24.0	24.4	27.7	20.0	16.1	141.0	94.0
9.4	22.2	28.3	49.8	16.6	30.0	156.3	104.2
30.0	23.3	25.5	26.1	11.1	10.0	126.0	84.0
13.8	31.1	24.4	32.2	12.2	35.5	149.2	99.5

SECOND CROP.—The parked area was planted in cowpeas, between the bean rows, on June 13th, and two weeks later was fertilized with eight tons of cow manure. This was preparatory to planting the land in alfalfa which was done Sept. 28th. The peavines were cut for hay. The unparked land was planted to sweet potatoes without additional fertilizer and gave yields at the following rates per acre: plat 1, 56 bushels; plat 2, 68 bushels; plat 3, 64 bushels; plat 4, 63 bushels. The crop was badly injured by the dry fall and early frost.

Tomatoes.—The tomato seeds were planted in hot beds in January, and the young plants removed to cold frames about six weeks later. The plants were set out in the field on March 31st. It was intended to plant these on parked and unparked land just as with the beans, but unfortunately a lot of the plants were destroyed and the only ones set out were on the land where cattle had been fed. They were fertilized in eight different ways using 500 pounds per acre of a fertilizer containing 3 per cent. each of nitrogen and potash and 7 per cent. of phosphoric acid as a unit application. The nitrogen in this fertilizer was furnished equally by cottonseed meal and nitrate of soda, the latter being applied after the plants had commenced growing in the field. These tomatoes made a fine growth of vine and set a lot of fruit, but, until the rains began on June 9th, nearly every tomato was destroyed either by the cotton boll worm or by the blossom end rot. The vines were hand-picked almost daily during this time, but the worms could not be suppressed. The trimmer, or tobacco worm, also gave much trouble. After the rains began, the rot disappeared almost entirely, the worms decreased in number and a quantity of nice fruit was gathered. The vines were still bearing July 16th, when they were cut away to make room for other crops.

The following table gives the amount of fertilizer and the weight of tomatoes on each 1-20 acre plat and also the calculated amount of fruit in bushels per acre:

RESULTS WITH TOMATOES.

No. of Plat.	Amount of Fertilizer in pounds per 1-20 Acre plat.	Yield in pounds per 1-20 Acre plat.										Total lbs per plat	Total lbs per acre	Total bush. per acre
		May 30	June 5	June 12	June 19	June 22	June 25	July 3	July 6	July 10	July 16			
1	No Fertilizer		.5	6.5	3.5	10.5	23.0	41.0	11	4.5	46.5	147.0	2940.	48.0
2 (N P K)	5.25 Cottonseed Meal 2.7 Nitrate of Soda 11.25 Acid Phosphate 5.25 Kainit	35.0	11.0	16.0	24.5	16.0	26.5	32.0	28.0	64.0	84.0	337.0	6740.	112 0
3 (N P K L)	5.25 Cottonseed Meal 2.7 Nitrate of Soda 12.25 Acid Phosphate 5.25 Kainit 50.0 Lime	17.5	12.0	9.5	13.5	13.5	38.5	37.5	36.0	50.0	66.0	293.5	5870.	98.0
4 (N½ P K½)	2.7 Cottonseed Meal 1.85 Nitrate of Soda 12.7 Acid Phosphate 2.7 Kainit	25.0	10.0	6.0	15.5	19.5	61.0	3.5	24.0	52.5	76.0	293.0	5860.	98.0
5 ½(N P K)	2.7 Cottonseed Meal 1.85 Nitrate of Soda 6.3 Acid Phosphate 2.7 Kainit	23.0	9.0	3.0	17.5	4.0	43.0	32.5	43.0	88.0	166.0	429.0	8580.	143.0

RESULTS WITH TOMATOES—CONTINUED.

No. of Plat.	Amount of Fertilizer in pounds per 1-20 Acre plat.	Yield in pounds per 1-20 Acre plat.										Total lbs per plat	Total lbs per acre	Total bush. per acre
		May 30	June 5	June 12	June 19	June 22	June 25	July 3	July 6	July 10	July 16			
6 (N_2 P K)	10.5 Cottonseed Meal 5.4 Nitrate of Soda 11.3 Acid Phosphate 4.8 Kainit	25.0	14.0	13.0	25.5	22.5	52.5	32.5	54.0	98.0	143.0	480.0	9600.	160.0
7 (N P_2 K)	5.25 Cottonseed Meal 2.7 Nitrate of Soda 24.5 Acid Phosphate 5.25 Kainit	27.5	13.5	4.5	12.5	24.0	40.5	51.0	18.0	135.0	132.0	458.5	9170.	153.0
8 (N P)	5.25 Cottonseed Meal 2.7 Nitrate of Soda 12.25 Acid Phosphate	38.0	19.0	21.5	21.5	11.5	40.5	75.0	20.0	121.0	145.0	513.0	10260.	171.0

Second crop. — All told the Station had three-quarters of an acre in tomatoes and followed them with second crops of corn, cantaloupes, sweet potatoes and watermelons. The one-third acre in sweet potatoes yielded 45 bushels; the cantaloupes made a complete failure; the watermelons did only fairly well; while the corn acted as a trap for the cotton boll worm moths and was almost completely eaten up by them.

Asparagus.—Last spring an additional one-half acre was planted in asparagus crowns, making a total of three-quarters of an acre in this crop. It was fertilized in ten different ways, but as it is not yet old enough to produce marketable grass, no results have been obtained. Four pounds of asparagus seed were also planted in the spring on one-third of an acre of land. These came up to a perfect stand and the plants have grown remarkably well. The crowns are now larger than the ones put out in the spring, which cost $5.00 per 1000, and there are something like 20,000 crowns on the one-third of an acre. Apparently asparagus is a crop admirably adapted to this section of the State. That on the Station grounds has been the object of much favorable comment by persons who have seen it.

Miscellaneous vegetables.—Small patches of onions, beets, carrots, turnips, lettuce, radishes, egg plants, peppers, cucumbers, canteloupes and watermelons have been grown. The Station's lands are new, but even under present conditions eggplants, peppers, radishes, turnips and watermelons have been grown successfully.

Two and one-half acres have been set aside for vegetables requiring large amounts of plant food and during the past fall twenty-five tons of cow manure have been hauled from saw-mill lots nearby and distributed over it. This will be supplemented by additional manure, composts and commercial fertilizers.

Two varieties of cantaloupes and four of watermelons were tested. The canteloupes were very poor indeed, while the watermelons did well. These melons were planted in plats 8 feet by 320 feet, making 1-17 of an acre. A record was kept of sales from each plat and was as follows: Duke Jones, $8.25; Florida Favorite, $3.45; Improved Georgia Rattlesnake, $3.70; Kolb's Gem, $5.60. At least one-half of the Rattlesnake melons rotted before ripening, which was true with both spring and fall crops.

STAPLE CROPS.

Corn, (*Fertilizer Test*)—Thirty-eight plats of ground, each 14x156 feet were used to test the fertilizer requirements of corn and were planted March 18th with Mosby Prolific seed. The land had been well prepared and was frequently cultivated. This corn was cut and shocked in August, and when perfectly dry was slip-shucked and the ears and stover weighed. At this time one hundred pounds of the ears were shucked and shelled and gave 79 pounds of grain, 10.5 pounds of cob and 9.5 pounds of shucks. In calculating results to bushels per acre 72 pounds of slip-shucked corn was taken as a bushel. One hundred pounds per acre of a fertilizer containing 3 per cent. each of nitrogen and potash and 7 per cent. of phosphoric acid were used as a unit application and variations of the quantity used have been in easy multiples of this amount. In the table, following the last six results—33 to 38 inclusive—were obtained on land where cattle had been parked. In comparing these results it would be well, perhaps, to add per acre 2.5 bushels of corn and 460 pounds of stover to plats 17 to 32 inclusive, and also to plats 36, 37 and 38 in order to offset the effects of a road that formerly ran through this portion of the field. The yields of the last seven varieties named in the table giving results with varieties of corn were affected by this road, and in making comparisons, a similar adjustment might be made.

RESULTS WITH FERTILIZERS UNDER CORN. ***

No. of Plat.	Amount of Fertilizer Calculated in Pounds Per Acre.		Yield per 1-20 Acre Plat.		Calculated Yield Per Acre.	
			Slip Shucked Ears in Pounds.	Stalks in Pounds.	Corn in Bushels.	Stalks in Pounds.
1		No Fertilizer	90	77	25	1540
2	100	Cottonseed Meal	95	100	26.4	2000
3	200	Cottonseed Meal	120	90	33.3	1800
4	100	Dried Blood	96	109	26.6	2180
5	400	Cottonseed	91	85	25.3	1700
6	100	Acid Phosphate	124	75	34.5	1500
7	200	Acid Phosphate	133	117	37.5	2340
8	100	Kainit	107	72	29.7	1440
9	200	Kainit	113	88	31.5	1760
10			99	77	27.5	1540
11	44	Cottonseed Meal				

RESULTS WITH FERTILIZERS UNDER CORN—Continued.

No. of Plat.	Amount of Fertilizer Calculated in Pounds Per Acre.		Yield Per 1-20 Acre Plat.		Calculated Yield Per Acre.	
			Slip Shucked Ears in Pounds.	Stalks in Pounds.	Corn in Bushels	Stalks in Pounds.
(N P)	40.4	Acid Phosphate	95	71	26.4	1420
12	132	Cottonseed Meal				
$N_3 P_3$	121.2	Acid Phosphate	115	82	32.0	1640
13	88	Cottonseed Meal				
$N_2 P_4$	161.6	Acid Phosphate	133	60	37.0	1200
14	88	Cottonseed Meal				
$N_2 P_5$	202	Acid Phosphate	142	81	40.0	1620
15						
$N_2 P_5$	200	Ground Bone	142	75	40.0	1500
16	84	Cottonseed Meal				
$N_2 P_5$	414	Lime and Acid Phos. Mixt.	142	100	40.0	2000
17	132	Cottonseed Meal				
	121.2	Acid Phosphate				
$N_3 P_3 L$	100.0	Oyster Shell	86	56	24.0	1120
18	132	Cottonseed Meal				
$N_3 P_2$	72	Acid Phosphate	98	62	27.2	1240
19	176	Cottonseed Meal				
$N_4 P_2$	62	Acid Phosphate	116	75	32.2	1500
20	220	Cottonseed Meal				
$N_2 P_2$	52	Acid Phosphate	127	79	35.3	1580
21	132	Cottonseed Meal				
$N_3 K_3$	56	Kainit	97	81	27.0	1460
22	150	Acid Phosphate				
$P_3 K_3$	74	Kainit	115	85	32.0	1700
23	44	Cottonseed Meal				
	40.4	Acid Phosphate				
N P K	18	Kainit	126	87	35.0	1740
24	132	Cottonseed Meal				
	22	Acid Phosphate				
N_3 P K_3	56	Kainit	112	81	31.1	1620
25	132	Cottonseed Meal				
	70	Acid Phosphate				
$N_3 P_2 K_3$	56	Kainit	116	87	32.2	1740
26	132	Cottonseed Meal				
	121.2	Acid Phosphate				
$N_3 P_3 K_3$	56	Kainit	119	73	33.0	1460
27		No Fertilizer	88	54	24.5	1080
28	88	Cottonseed Meal				
	130	Acid Phosphate				
$N_2 P_3 K_2$	38	Kainit	107	63	30.0	1260
29	44	Cottonseed Meal				
	140	Acid Phosphate				
N P_3 K	18	Kainit	98	65	27.2	1300
	132	Cottonseed Meal				
30	121.2	Acid Phosphate				
	56	Kainit	100	63	27.7	1260
$N_3 P_3 K_3 L$	100.0	Oyster shell				
31	132	Cottonseed Meal				
	121.2	Acid Phosphate				
$N_3 P_3$ K	6	Kainit	102	69	28.3	1380
32						
$N_2 P_5$	165	Ground Bone	100	70	27.7	1400

These plats were crossed by a narrow strip formerly used as a public road.

RESULTS WITH FERTILIZERS UNDER CORN—Continued.

No. of Plat.	Amount of Fertilizer Calculated in Pounds Per Acre.		Yield Per 1–20 Acre Plat.		Calculated Yield Per Acre.	
			Slip Shucked Ears in Pounds	Stalks in Pounds	Corn in Bushels	Stalks in Pounds
33	No Fertiiizer	Parked land.	154	150	43	3000
34	200 Acid Phosphate		194	130	54.0	2600
35	124.6 Cottonseed Meal 135 Acid Phosphate 58 Kainit		155	110	43.2	2200
N_3 P_2 K_3						
36	62.4 Cottonseed Meal 147.2 Acid Phosphate 29 Kainit		148	115	41.1	2300
$N_1\frac{1}{2}$ P_3 $K_1\frac{1}{2}$						
37	124.6 Cottonseed Meal 294.4 Acid Phosphate *		165	125	45.8	2500
N_3 P_6 K_3	58 Kainit					
38	124.6 Cottonseed Meal		151	130	42.0	2600
N_3 P_3	147.2 Acid Phosphate					

* Strip formerly used as a road crossed plats 36, 37 and 38.

* * * The fertilizer tests, reported in this table, are not all comparable with each other. See summary at the end of this report.

Test of Varieties.—On March 24th, fourteen varieties of corn were planted in one-tenth acre plats on land that had just been plowed and fertilized at the rate of 300 pounds of cotton seed and 100 pounds of acid phosphate per acre. The table following gives the results obtained:

(The table giving the results obtained with varieties of corn formed a part of the manuscript, and, of the corrected proof sheet for this bulletin, but the printer left it out of the printed bulletin. Early Breadfield and Mosby Prolific were the two best varieties.

REMARKS: Corn suffered for rain from the time it came up until it was about ready to tassel. The extremely hard rains of March packed the land after it had been broken, and the cool nights of April and cut worms together necessitated a lot of replanting. However, the seasons were favorable during its most critical stage of growth and the crop was a remarkably good one. All told, the Station had 10.9 acres in corn and put into the crib 281 bushels. Four acres of this was first-year land, and 2.9 acres land on which corn was grown as a second crop. All corn stalks were saved and put up in a rick in the barn lot where the horses have access to them at all times. They have been the only fodder used for the past three months and will be for two months to come. A crop of cowpeas has followed corn in every instance, all of which were cut and saved for hay, and on about one-half of the land peas were gathered as well.

Cotton, (*Fertilizer Test*).*—Practically the same tests just reported with corn were repeated with cotton, which was planted April 7th on land that had been prepared and fertilized on March the 18th. The last six plats in the table following were on land where the steers were parked. The effects of the old road that had previously run through the field were shown on plats 17 to 32 and probably reduced the average yield some 80 pounds of seed cotton per acre. Therefore in comparing the first 32 experiments of the table it would be well to consider this fact and to add 4 pounds to each of the above mentioned plats. Russell's Big Boll was the variety used in all these tests.

*The results reported in the following table are not all comparable with each other. See summary at the close of the report.

Results Obtained With Varieties of Corn. *

Variety.	Date of First Tassel.	Date of Maturity.	Weight of 100 Average Ears in Pounds.	Weight of Shelled Corn on 100 Ears in Pounds.	Stalks in Pounds per Acre.	Corn in Bushels per Acre.
(Early Breadfield)						
Major Berry	June, 11	July, 28	46.3	37.0	2180	30.0
Gentry's Early Market	May, 31	July, 24	35.7	26.5	1528	22.3
Improved Southern White Snow Flake	June, 9	July, 29	41.7	33.0	1590	26.0
White Majestic	June, 12	July, 30	42.7	36.5	2122	30.2
Hickory King	June, 6	July, 29	38.2	32.5	1680	24.4
Holts Strawberry	June, 17	August, 7	50.2	40.0	2137	27.0
New White Cap Yellow Dent	May, 23	July, 20	29.7	22.0	880	14.0
Mosby's Prolific	June, 17	August, 17	46.0	40.0	1500	19.5
Blount's Prolific	June, 6	July, 24	30.7	23.5	1512	19.3
Cocke's Prolific	June, 13	July, 30	36.2	28.5	2250	20.0
Virginia White Dent	June, 13	July, 30	37.5	30.5	1890	19.9
Eureka	June, 14	July, 30	33.7	26.0	1942	18.3
Improved Golden Dent	June, 9	July, 29	37.7	30.5	1575	21.0
Clark's Mastodon	May, 29	July, 20	34.7	27.5	970	14.6

Yields of these plats slightly affected by old road strip

* The results with varieties are not all comparable with each other. See summary at the end of this report.

Results with Fertilizers Under Cotton.

No. of Plat.	Amount of Fertilizer Calculated in Pounds Per Acre.		Yield of Seed Cotton in Pounds Per 1–20 Acre Plat.					Total Calculated Per Acre
			Sept. 1	Sept. 15	Oct. 5	Nov. 16	Total	
1		No Fertilizer	5	10.5	17	9	41.5	830
2	100	Cottonseed Meal	7	12.0	16	8.5	43.5	870
3	200	Cottonseed Meal	11.5	16.5	19	7	54	1080
4	100	Dried Blood	4.5	9.0	13.0	10.0	36.5	730
5	400	Cotton Seed	6.0	12.0	13.0	10.0	41.0	820
6	100	Acid Phosphate	11.0	17.0	17.0	9.5	54.5	1090
7	200	Acid Phosphate	16.5	23.0	19.0	7.5	66.0	1320
8	100	Kainit	6.0	9.0	10.0	8.5	33.5	670
9	200	Kainit	5.5	9.0	9.0	10.0	33.5	670
10		No Fertilizer	5.0	7.5	10.0	8.0	30.5	610
11	44	Cottonseed Meal						
N P	40.4	Acid Phosphate	15.5	16.0	14.0	8.0	53.5	1070
12	132	Cottonseed Meal						
N_3 P_3	121.2	Acid Phosphate	19.0	23.0	19.5	7.0	68.5	1370
13	88	Cottonseed Meal						
N_2 P_4	161.6	Acid Phosphate	15.5	21.0	20.0	7.0	63.5	1270
14	88	Cottonseed Meal						
N_2 P_5	202	Acid Phosphate	18.5	21.0	17.0	5.0	61.5	1230
15								
N_2 P_5	200	Ground Bone	15.5	29.0	16.5	6.0	67.0	1340
16	84	Cottonseed Meal						
N_2 P_5	414	Lime and Acid Phosphate Mixture	16.5	29.0	19.0	5.0	69.5	1390
17	132	Cottonseed Meal						
	121.2	Acid Phosphate	21.0	16.0	12.0	3.0	52.0	1040
N_3 P_3 L	1000	Oyster Shells						
18	132	Cottonseed Meal						
N_3 P_2	72	Acid Phosphate	16.5	14.5	14.0	4.0	49.0	980

Results slightly affected by an old road.

Results with Fertilizers Under Cotton—Continued.

No. of Plat.	Amount of Fertilizer Calculated in Pounds Per Acre.			Yield of Seed Cotton in Pounds Per 1–20 Acre Plat.					Total Calculated Per Acre
				Sept. 1	Sept. 15	Oct. 5	Nov. 16	Total	
19	176	Cottonseed Meal	Results slightly affected by an old road.						
N_4 P_2	62	Acid Phosphate		18.0	18.0	13.0	3.0	52.0	1040
20	220	Cottonseed Meal							
N_5 P_2	52	Acid Phosphate		21.5	19.5	12.0	4.0	57.0	1140
21	132	Cottonseed Meal							
N_3 K_3	56	Kainit		19.5	16.0	11.0	4.0	50.5	1010
22	150	Acid Phosphate							
P_3 K_3	74	Kainit		24.0	18.5	8.0	3.5	54.0	1080
23	44	Cottonseed Meal							
	40.4	Acid Phosphate		22.0	10.5	7.0	2.5	42.0	840
N P K	18	Kainit							
24	132	Cottonseed Meal							
	22	Acid Phosphate		19.5	16.0	9.0	3.5	48.0	960
N_3 P K_3	56	Kainit							
25	132	Cottonseed Meal							
	70	Acid Phosphate		27.0	17.5	9.0	3.5	57.0	1140
N_3 P_2 K_3	56	Kainit							
26	132	Cottonseed Meal							
	121.2	Acid Phosphate		36.0	21.0	7.0	1.5	65.5	1310
N_3 P_3 K_3	56	Kainit							
27		No Fertilizer		11.5	9.5	8.0	3.0	32.0	640
28	88	Cottonseed Meal							
	130	Acid Phosphate		30.5	18.0	8.0	2.5	59.0	1180
N_2 P_3 K_2	38	Kainit							
29	44	Cottonseed Meal							
	140	Acid Phosphate		26.0	17.5	8.0	2.5	54.0	1080
N P_3 K	18	Kainit							

Results with Fertilizers Under Cotton—Continued.

No. of Plat.	Amount of Fertilizer Calculated in Pounds Per Acre.		Yield of Seed Cotton in Pounds Per 1–20 Acre Plat.					Total Calculated Per Acre
			September 1	September 15	October 5	November 16	Total	
30	132	Cottonseed Meal	34.0	21.5	7.0	2.0	63.5	1270
	121.2	Acid Phosphate						
$N_3 P_3 K_3 L$	56	Kainit						
	1000	Oyster Shell						
31	132	Cottonseed Meal	26.5	17.0	9.0	3.0	49.5	990
	121.2	Acid Phosphate						
$N_3 P_3 K$	6	Kainit						
32	165	Ground Bone	24.5	16.0	12.0	3.0	55.5	1110
33	62.4	Cottonseed Meal	11.5	36.0	27.0	9.0	83.5	1670
	147.2	Acid Phosphate						
$N\ 1\frac{1}{2}\ P_3 K_{1\frac{1}{2}}$	29	Kainit						
24								
P 4	200	Acid Phosphate	14.5	44.0	30.0	10.0	98.5	1970
35	124.6	Cottonseed Meal	23.0	44.5	22.0	7.0	96.5	1930
	135	Acid Phosphate						
$N_3 P_3 K_3$	58	Kainit						
36		No Fertilizer	7.0	17.0	16.0	5.0	45.0	900
37	124.6	Cottonseed Meal	24.5	38.0	26.0	7.5	96.0	1920
	294.4	Acid Phosphate						
$N_3 P_6 K_3$	58	Kainit						
38	124.6	Cottonseed Meal	19.0	37.0	34.0	14.0	104.0	2080
$N_3 P_3$	147.2	Acid Phosphate						

Results slightly affected by an old road.

On parked area.

Tests of varieties.—On April 9th land that had previou
ly been broken four inches deep and harrowed was laid c
into rows 3.7 feet apart and fertilized at the rate of 3(
pounds per acre of the complete fertilizer, the analysis of which
given in table 2. These rows were 300 feet long and four of the
were used in each test, making one-tenth of an acre. The tw
south rows of each variety were first two-furrowed and the fe
tilizer distributed on the list, harrowed in, and the bed complete
The fertilizer on the two north rows was applied directly in t
drill, mixed with bull-tongue and then bedded upon. These la
named rows gave uniformly more cotton at each picking tha
the first, and the results reported in the following table were ca
culated from the two rows receiving fertilizer in the drill. T
average of the eleven plats receiving the fertilizer near the su
face was 834 pounds of seed cotton, while those receiving t
fertilizer about three inches beneath the surface, it was 10(
pounds. (The Station is indebted to John M. Parker & Co.,
New Orleans, for classing this cotton.)

Results of Tests With Varieties of Cotton.

Name.	Weight of Seed Cotton in Pounds per Acre	Weight of Lint in Pounds per Acre.	Per cent. of Lint to Seed Cotton.	Price per Pound of Lint based on Middling 12c N. O.	Value of Lint per Acre.	Value of Seed at $16.00 per Ton.	Total Value of Crop per Acre.	Length of Staple in Inches.	Class.	Remarks.
Allen's Improved Long Staple	800	229.6	28.7	15.5	35.58	4.56	40.14	1 5-16	Good Middling*	Slightly gin cut
Black Rattler	1070	366.5	34.26	12¾	46.73	5.63	52.36	1⅛	Strict Middling*	Not genuine Black Rattler
Duncan's Mammoth										
Big Boll Prolific	1280	455.0	35.55	12	54.60	6.60	61.20	1	Barely Strict Middling	Upland Staple
Green's Gayoso Prolific	890	286.0	32.14	12⅛	34.68	4.83	39.51	1	Strict Middling	Upland Staple
Griffin's Long Staple	1030	343.0	33.33	12¾	43.73	5.50	49.23	1⅛	Between strict & Good Middling	fibers even and Strong
Jones' Improved	940	327.6	34.85	12 3-16	39.92	4.90	44.82	1	Barely Good Middling	Upland Staple
King's Improved	1050	358.4	34.14	12⅛	43.45	5.53	48.98	1	Between Strict & Good Middling	Upland Staple
Peterkin	900	311.0	34.54	12 1-16	37.52	4.71	42.23	1	Strict Middling	Upland Staple
Shine's Extra Early Prolific	1300	455.7	35.06	12	54.69	6.75	61.44	⅞	Barely Strict Middling	Upland Staple
Texas Bur	1080	327.4	32.74	12 1-16	39.49	5.38	44.87	1	Strict Middling	Upland Staple

Distance in row and drill for planting.—On April 11th land that had been well prepared was laid off into rows three, three and a half and four feet apart and fertilized with 300 pounds per acre of "Complete Fertilizer." These rows were bedded and planted thick in drill with Green's Gayosa cotton seed. A good stand was obtained, it being intended to show results from 3,600 to 40,000 plants per acre. The laborers thinned this cotton by mistake, which made it impossible to get over 13,520 stalks per acre. The plats on which these experiments were conducted contained, as near as possible, one-twentieth of an acre each, but the rows being of the same length and of different widths made it impossible to have them all the same size. The number of stalks in each plat were counted, which being multiplied by its fractional part of an acre appear in the table as the actual number of stalks per acre. A lack of space forced these experiments into a somewhat broken portion of the field which probably accounts for some of the irregularity in the yields obtained.

Results Obtained By Varying the Number of Plants.

Width of Row.	Distance in Drill.	Actual Number of Stalks Per Acre Calculated.	Theoretical Number of Stalks Per Acre.	Yield Per Acre in Pounds of Seed Cotton, Calculated.
3 ft.	9 in.	13,520	19,360	815
3 ft.	1 ft.	9,160	14,520	685
3 ft.	2 ft.	7,520	7,260	890
3 ft.	3 ft.	4,880	4,840	790
3.5 ft.	9 in.	13,044	16,594	694
3.5 ft.	1 ft.	9,172	12,446	526
3.5 ft.	2 ft.	6,973	6,223	828
3.5 ft.	3 ft.	4,379	4,148	741
4 ft.	9 in.	8,382	14,560	757
4 ft.	1 ft.	8,000	10,890	691
4 ft.	2 ft.	5,735	5,445	750
4 ft.	3 ft.	3,647	3,630	622

Cowpeas, (*Test of varieties.*)—Twelve varieties of cowpeas were planted April 10th in rows 3 feet apart and in plats of one-tenth acre each. It was intended that one-half of each variety should be cut for hay at the proper stage, while the other half should be left to ripen thoroughly and the yield of peas determined.

On account of the seasons (presumably) none of the varieties made enough peas to justify picking them and they were all cut for hay as fast as they reached maturity. When it was seen that no results could be gotten as to the yield of peas on the first crop, a second planting of all varieties was made on July 24th. These never did well and are not reported. All peas were fertilized at the rate of 200 pounds of acid phosphate per acre, and in the table following the results are all for perfectly dry hay. On hauling up field cured hay, samples of about twenty pounds each were weighed out, allowed to dry thoroughly, and then re-weighed, the percentage of moisture thus found being deducted from the original weighing. This field cured hay lost an average of about 25 per cent. during the thorough drying.

Soy and velvet beans are reported in the table with the cowpeas. The soy beans did not develop tubercles on the roots until the latter stages of their growth and were never thrifty growers. One-half acre of land was embraced in the test. A like quantity of land was planted in velvet beans on April 13th, and one-half of them cut for hay July 28th, sometime before they had attained a maximum growth. The one-fourth acre remaining continued to grow until October, but did not mature fruit before they were killed by frost October 25th.

RESULTS WITH COWPEAS.

Name of Variety.	Date of Cutting.	Yield of Hay in Pounds per Acre, Calculated.
Whippoorwill	Aug. 7	2880
Red Ripper	Aug. 10	2350
Clay	Aug. 10	2556
Taylor	July 28	2420
Southdown	Aug. 10	2720
New Era	Aug. 10	2628
Black	July 28	2090
Unknown	Aug. 10	2916
Iron	Aug. 10	2160
Large Black Eye	July 28	2090
Early Black Eye	July 15	1369
Lady	Aug. 10	1944
Soy Beans	July 27	1087
Velvet Beans	July 28	1900

Sweet potatoes.—A total of four acres were planted in sweet potatoes, but all except one and one-half acres followed some vegetable crop.

Those having the entire season in which to mature made remarkably good yields, but the severe drought after the middle of September injured the later plantings considerably. The lands here are perfectly adapted to this crop and they not only produce large quantities per acre, but the potatoes are of nice size and excellent flavor. Only four experiments were conducted to show the fertilizer requirements of this crop and these were on the land where cattle had been parked.

The four plats used were each one-eighteenth of an acre in size and the following table gives the rate per acre at which they were fertilized and the quantities of potatoes produced:

RESULTS WITH SWEET POTATOES.

Number of Plat.	Amount of Fertilizer Calculated in Pounds Per Acre.	Yield of Merchantable Potatoes in Bushels per Acre.	Yield of Seed Potatoes in Bushels per Acre.	Total yield per Acre in Bushels (60 pounds).
1	160 Acid Phosphate 126 Cottonseed Meal	194.2	17.5	211.7
2	136 Acid Phosphate	259.0	15.7	274.7
3	No Fertilizer 126 Cottonseed Meal	241.5	18.9	260.4
4	136 Acid Phosphate 58 Kainit	180.9	17.1	198.0

REMARKS: It would seem from the above results that the manure already on the land was amply sufficient for this crop without additional fertilizer.

Sugar cane.—There is no other crop, perhaps, that may be grown on these pine lands with the same assurance of net profits as sugar cane. Not only do they produce a good tonnage, but the quality of syrup made from them far surpasses that from the richer lands of the delta. The same experiment with fertilizers begun last year with seed cane were repeated this year with the stubble. Unfortunately these stubbles sprouted poorly and the stand of cane was so bad that the experiment was abandoned.

Last fall the immature tops of the cane were saved, some with two and some with one mature joint left on them. These were carefully bedded by sticking the ends into a well prepared seed bed, the tops lapping shingle fashion and carefully covered with dirt. These tops kept perfectly, but were matured very little if any more than when put up in the fall, and on being planted in the spring very few of them came up. This fall we saved some tops in a similar manner, but left as many as five mature joints on them.

The Station made this year 140 gallons of syrup, besides saving a lot of seed canes.

MISCELLANEOUS FARM CROPS.

Spanish peanuts.—Last year the peanuts grown here had a very large percentage of faulty pods, known generally as "pops," and it has been stated that the nuts grown in this section are usually so affected. A large part of these faulty pods last year and this were really eaten out by wood lice and the trouble was caused more by the newness of the land than by any tendency of the soil itself to produce the disease. In order to find a remedy whereby this tendency might be lessened, and at the same time get a general idea of the fertilizer requirements of the crop, seven plats were fertilized in different ways and planted April 16th. Lime is supposed to prevent "pops," so in the seven plats of one-twentieth acre each this has been used in six combinations with other fertilizers and in three different forms. The following table gives these results in detail:

RESULTS WITH SPANISH PEANUTS.

Number of Plat.	Amount of Fertilizer Calculated in Pounds Per Acre.	Yield of Nuts in Pounds per Acre.	Yield of Hay in Pounds per Acre.	Per Cent. of Faulty Pods
1	152 Acid Phosphate	1600	850	2.5
2	126 Cottonseed Meal 135 Acid Phosphate 1000 Ground Oyster Shells	1450	2180	4.3
3	126 Cotton seed Meal 135 Acid Phosphate 58 Kainit 1000 Ground Oyster Shell	1580	3040	3.8
4	126 Cottonseed Meal 135 Acid Phosphate 58 Kainit 1000 Airslaked Lime	1180	3030	2.5
5	Manure on Parked Land 1000 Ground Oyster Shells	1739	2220	4.2
6	Manure on Parked Land 200 Acid Phosphate 1000 Ground Oyster Shells	1998	2886	3.7
7	Manure on Parked Land 332 Reverted Acid Phosphate	1939	2960	3.0

REMARKS: The hay saved from these vines was first class in quality and stock are fond of it. The nuts and vines were saved by pulling and turning up-side down for about two days, then putting into cocks just as with peavines, and capping with old sacks or regular canvas to protect from rain. They were left in this shape for a week and the nuts pulled from the vines, sunned a few days, and then weighed. About one-half acre of peanuts were grown in one of the paddocks and a somewhat larger patch of chufas, and the two crops marketed by being first converted into pork. The peanut and chufa are paying crops for this belt, for they grow to perfection and are the cheapest producers of pork in the list of hog crops.

Grasses and clovers.—The Station reported last year 44 tests with grasses, clovers and vetches. These have all been continued and frequent notes taken on them, while about twenty additional kinds have been added during the present year. As a rule alfalfa, red clover, vetch and sapling clover have done well when they have been fertilized with stable manure; but otherwise they have done poorly, even when well supplied with commercial fertilizer. The most of the grasses have done nicely during wet weather, almost completely drying up in periods of drought, but reviving again when water was supplied to them. The grasses have all received small applications of commercial fertilizers.

On April 13th, teosente, kaffir corn, beggar weed and milo-maize were planted on parked land in plats varying in size from 1-115 to 1-15th of an acre, each being fertilized at the rate of 300 pounds per acre of a complete fertilizer. About one-fifth acre of milo-maize was also planted on unparked land and similarly fertilized. The following table gives the size of the plat, the actual weight of each cutting and the calculated yield per acre:

RESULTS WITH FORAGE PLANTS.

Name of Crop.	Size of Plat in Fraction of Acre.	First Cutting June 30 in Pounds Per Plat.	Second Cutting August 20 in Pounds Per Plat.	Third Cutting October 21 in Pounds Per Plat.	Total Calculated Yield Per Acre.
Teosinte	.0087	.....	290	.....	33,350
Kaffir Corn	.02	.....	240	130	18,500
Beggar Weed	.02	.....	40	20	3,000
Milo Maize	.066	341	830	270	21,623
Milo Maize (Unparked Land)	.19	325	795	180	6,842

Cassava.—The Station was very unfortunate in regard to getting cassava canes for seed. A quantity sufficient for planting one-half acre was shipped us, but was six weeks on the road and was dead when it reached here. It was almost impossible to get seed elsewhere, but fifty canes were obtained more than one month late and were planted May 27th. Only a small percentage of the eyes on these canes were alive and just fifty hills came up, which grew off nicely. It was planted in checks four feet apart each way, the canes being first cut into joints just as is sometimes done with sugar cane. On November 12th, an average stalk of this cassava was taken up by the roots and photographed. (See half-tone on title page.) The edible roots from this one cane weighed 6¾ pounds. The indications are that cassava will be a very valuable crop for this section of the State.

OATS AND WHEAT.—During the fall of 1902, ¾ of an acre each were sown in Turf oats and Park wheat. Both of these crops looked fairly well until the middle of March, when they were attacked by rust and almost completely destroyed. The freeze on February 16th, also killed a good many of the oats. The two crops were cut May the 20th, when the oats yielded at the rate of 436 pounds and the wheat 748 pounds of hay per acre.

SECOND CROP.—The oats land was broken and fertilized at the rate of 150 pounds each of acid phosphate and cottonseed meal and planted to Mexican June corn which produced 29.5

bushels per acre. The wheat land fertilized at the rate of 200 pounds of acid phosphate per acre produced 2760 pounds of well cured cowpea hay per acre. Several acres were sown in the spring to Texas rust proof oats, but hardly made the original seed. This fall the Station has planted four acres in rust proof oats, 2.5 acres in rye and ¾ of an acre in Fultz wheat.

SUBSOILING AND TILLAGE TESTS.—On March 23d, land 132.4 feet wide by 300 feet long was equally divided and one-half broken 5 inches deep while the other half was prepared 18 inches deep, using a regular subsoil plow below six inches. These two portions were each subdivided into four one-tenth acre plats. Two plats of cotton and two of corn were planted on each of these two portions. The cotton was fertilized at the rate of 200 pounds of acid phosphate and 100 pounds of cottonseed meal per acre and planted April the 9th in Black Rattler cotton seed. The corn was fertilized at the rate of 150 pounds each of acid phosphate and cottonseed meal and planted March 25th with Berry's corn. In these tests the shallow cultivation was done with a Perry cultivator, which is very much on the order of an old-fashioned side harrow. The deep cultivation was done with a bull-tongue plow, with the exception of the last, in which a sweep was substituted to avoid deep root pruning. The following table is self explanatory and gives results in detail:

RESULTS WITH DEEP AND SHALLOW PREPARATION AND CULTIVATION.

No. of Plat.	Crop.	Depth of Preparation in Inches.	Depth of Cultivation in inches.	Yield of Corn in Bushels Per Acre.	Yield of Stalks in Pounds Per Acre.	Yield of Seed Cotton in Pounds Per Acre.
1	Corn	18	5	30.2	1720	
2	Corn	18	3	29.2	1750	
3	Cotton	18	5			1165
4	Cotton	18	3			1315
5	Corn	5	5	32.5	1907	
6	Corn	5	3	32.6	2110	
7	Cotton	5	5			1225
8	Cotton	5	3			1245

DISTANCES FOR PLANTING PEAS IN DRILL.—On April 24th four rows of one-fortieth acre each were fertilized at the rate of 300 pounds per acre of a complete fertilizer, and planted to cowpeas different distances apart in drill. The first row was planted at the rate of 60 pounds of seed per acre and gave a calculated yield of 2520 pounds of hay; the second row planted at the rate of 30 pounds of seed per acre gave a calculated yield of 2440 pounds of hay; the third with 15 pounds of seed gave 1720 pounds of hay; while the fourth was planted in hills 1 foot apart, four peas to the hill, a rate of 12 pounds per acre, and gave a calculated yield of 1520 pounds of dry hay per acre.

SUMMARY

BY

W. L. HUTHINSON.

The results, obtained with fertilizers at the McNeill Branch Station, and reported in full by Mr. E. B. Ferris, in this bulletin and in bulletin No. 79, show that both phosphatic and nitrogenous fertilizers increase the yields of crops on these soils, phosphorous being most needed and increasing the yields more than any other element.

The results further show that a mixture of nitrogenous and phosphatic fertilizers gives the largest increase in yields and that maximum gains from the use of fertilizers may be had from such a combination or mixture.

The results do not show any demand for potassic fertilizers, but on the contrary plainly indicate that potash is not necessary to secure the greatest increases in yields by fertilization.

A mixture of 750 pounds of cottonseed meal and 1250 pounds of acid phosphate to the ton makes a good fertilizer for this State. From 125 pounds to 200 pounds of this mixture should be used to the acre under cotton and corn and should be applied in the drill or bed at the time of preparing the land for planting.

Parking cattle on the soils at McNeill enriches and improves the land in the most satisfactory manner.

Mississippi Agricultural Experiment Station.

BULLETIN No. 84. JANUARY, 1904.

REPORT OF FIELD WORK DONE AT THE COLLEGE STATION FOR 1903.

By W. R. PERKINS.

Introduction.—The greater portion of the Experiment Station field work has been done under the writer's charge during the past year. It has included experiments with varieties of cotton, corn, soja beans, and cowpeas; fertilizer tests with cotton, corn, oats, and wheat; experiments with Johnson grass, alfalfa, a number of forage crops, legumes, and grasses; and a number of experiments on miscellaneous subjects.

One of the difficulties in the way of field experiments, where a comparison of yield is to be made with varieties of plants or with different kinds of fertilizers, is the variation in productiveness of different plats of land. This is especially true on the college farm, the land being so variable as to make it almost impossible to obtain a plat of land of any area that is at all uniform in character, except in the valleys.

We have given especial attention to the preparation of the soil and the subsequent cultivation of the crops. It has been our aim to put

the land in good condition in all instances before planting any seed, and the results, we believe, justify this as the proper method to follow in all farming. Briefly stated our method has been to plow the land well and deep during the fall and winter, throwing it into eight foot beds and leaving them rough. The soil is preferably edged up by the plow instead of turned completely over. This allows it to be more deeply penetrated by the winter freezes and more thoroughly disintegrated by the frost. In the spring the treatment may vary depending on the roughness of the soil. If very rough and full of stalks or trash the disk harrow should be run across the eight foot beds and then the two-horse plow put in and the beds reversed if for corn, or if for cotton the beds may be split into two beds each with two furrows and a middle burster or reversed and then made into cotton beds. What has been said above refers to heavy loam or clay soils that are abundantly supplied with potential plant food. The light sandy soils of other sections of the state can be put in good condition with much less work, and it is doubtful if winter plowing would be beneficial except where it was desired to deepen the soil by incorporating some of the sub-soil with it. No iron-bound rules can be laid down for any operation in farming, the most that can be said is to know what conditions are to be brought about in the soil and then adapt the labor and implements at hand to that end. The ideal preparation of soil to enable the plant to get the most out of it is, to have it well broken—eight to ten inches—unless the subsoil is come in contact with before that depth is reached—in which case regulate the depth of plowing by the depth of soil—and have it so thoroughly pulverized that every grain of soil lies closely and compactly by its neighbor, and yet not tied to it in the everlasting state of a clod; for two grains joined together are theoretically a clod, while when millions of them unite into one mass it becomes a practical clod. It is hardly possible to reach this degree of perfection in preparing land yet we should always strive to approach it as near as possible. Clods are the most troublesome factor we have to contend with in the preparation of land, but we believe they are usually the result of the farmers overlooking one simple operation. When land is broken in the spring, if at all stiff and damp, it turns up in lumps of all sizes to as large as a water bucket. They are *lumps* at that time, but if the sun is allowed to shine on them for a few hours they become clods and as such baffle man in his efforts to thoroughly prepare his soil. Nothing but a soaking rain will put them in a condition to be gotten rid of, and that frequently does not come just at the right time. When these clods are in the lump state, or immediately after turning up they are easily broken and a good heavy harrow following close

behind the plow will generally remove them. The harrowing must be done before the sun has dried them out or turned them into clods. If the land is too dry when plowed up clods usually result, in which case nothing but a good season will enable you to get rid of them. The harrow should be close by and run over the land every half day or oftener as the plowing is done.

Cotton Varieties.—Thirteen plats of cotton of different varieties were planted and a stand secured on all except one. This was Truitt's Prolific variety, the seed of which were obtained from one of the large seed houses. They had evidently been heated as not over twenty-five stalks came up from the peck of seed planted.

The land was a piece of valley soil of medium productiveness. In 1901 it was in varieties of cotton. In the spring of 1902 it was sown in alfalfa. A stand came up but the unfavorable summer together with a heavy growth of crab-grass killed out the greater portion of it. During that year 3 loads of stable manure were scattered over the thinner portion of the plat.

In preparing the land for this year's cotton crop it was deeply broken with two-horse plows in March. Just before planting time it was put into four-foot beds with a one-horse plow and an iron tooth harrow run down the rows to further break up the turf. The cotton was immediately planted (April 20th) and the land rolled with an eleven-hundred-pound roller. The cultivation was done with a side-harrow, five tooth cultivator, Perry cultivator, and finally with a sixteen inch sweep. No rule being observed about what to plow with but making the decision at the time of plowing, always having in mind the keeping of a loose dust mulch on the surface, and at the same time keeping the beds at the proper height. The varieties were not planted in separate plats of given areas on account of the ever present variation in the soils, but one row of each variety was planted in regular order from No. 1 to No. 13, then another series was planted and so on till nine rows of each had been put in. The mixing of varieties when each row has on both sides of it, cotton of a different kind, as in our experiment, does not affect the yield, materially, the first year in either cotton or corn. This method of arrangement was more troublesome at planting and gathering time, but I believe gave good results based on the relative productiveness of the varieties and not on differences in quality of soil.

The table following gives yield at each picking for the plats and calculated yields per acre:

Yield of Varieties of Cotton.

NAME OF VARIETIES.	1st picking September 23rd	2nd picking October	3rd picking November	Total yield for year.	Yield per acre.
	LBS.	LBS.	LBS.	LBS.	LBS.
Allens Hybrid	59	55	17	131	1505
Davis Long Staple	60	58	18	136	1563
Excelsior	56	71	20	147	1689
Black Rattler	58	59	24	141	1620
Allens Hybrid	67	54	23	144	1655
Edgworth	74	71	22	167	1920
Hawkins	63	72	25	160	1840
Truitt	.....	.....	.....	.....	.....
Russell Big Boll	61	87	11	159	1827
Lewis Prize Prolific	69	79	17	165	1895
Gayoso Prolific	65	62	10	137	1574
Garrards Prolific	58	42	7	107	1382
King seed from Delta	51	55	12	118	1524

The area of each plat was .087 acres, except the two last varieties which were short one row each, giving them an area of .077 acres each.

The season was very favorable to the production of cotton in this vicinity and the varieties were all well covered with bolls, although there was considerable shedding during the latter part of August and early part of September.

Notes taken in the field indicate that the long staple varieties, Allen, Davis and Black Rattler, were all from four to five feet high and were long limbed varieties. Edgworth is noted as medium in limb and four to five feet high.

Hawkins, short limb, four to six feet high.

Russels Big Boll, long limb, four to six feet high—large green seed.

Lewis Prize Prolific, long limbs at bottom, four to six feet high.

Gayoso Prolific, medium limb, four to five feet high.

Garrard Prolific, three to four feet high, medium limb.

King—This variety was from seed grown in the Mississippi Delta. It has been grown and selected each year for nine years by Mr. D. A.

Sledge, of Indianola, Miss. The length of staple, which was more than a quarter of an inch longer than the ordinary King variety, shows what environment and selection of seed will do for any plant. This was the tallest and longest limbed cotton in the test.

Fertilizer test.—Results of fertilizer experiments, in the past, that have been conducted by the Experiment Station on the College farm, indicate that as a general rule they cannot be used with profit.

Our plan of work along that line for this season was to try the three elements of plant food—nitrogen, potassium and phosphorus—in various combinations, on a piece of land that was given very thorough tillage. It was thought that in this way the best results from the fertilizers could be obtained, as the perfect condition of the soil would aid in keeping up the supply of moisture, which is generally supposed to be the controlling factor in crop production on our soils. The piece of land was a very moderate incline from a small valley, and presented considerable difference in fertility between that in the valley where the first plats were located, and those furtherest off. The land had been thoroughly plowed twice before the fertilizers were distributed and the four foot beds made. The cotton was planted April 23rd, the land being in ideal condition, although the weather was very dry at the time and very little other cotton in the neighborhood, planted at about this time, came up till it rained. This piece of cotton began to appear above the ground in a few days showing the presence of a supply of moisture. This, coupled with the frequent and abundant showers all through the growing season till late in August, and the frequent cultivations given the crop, should have enabled the fertilizers to produce the best results, provided the land was in need of these elements of plant food. A heavy crop of cowpeas grew on the land in 1902.

The following table gives yields of crop and other data:

Yield of Cotton on Fertilized Plats.

Number of Plat	Cottonseed Meal lbs. per acre	Sodium Nitrate lbs. per acre	Acid Phosphate lbs. per acre	Kainit lbs. per acre	Yield seed cotton lbs. per acre
2	200	.....	.....	.....	1767
3	.....	100	.....	.....	1917
4	100	50	.....	.....	1880
5	100	50	200	.....	1844
6	100	50	.....	200	1906
7	100	50	200	200	2051
8	.....	.....	.....	.....	1762
9	.....	.....	200	.....	1698
10	.....	.....	.....	200	1624
11	.....	.....	200	200	1334
12	200	.....	200	.....	1226
13	.....	.....	.....	.....	1082
14	200	.....	.....	.....	1048
15	.....	150	.....	.....	1252
16	.....	.....	.....	.....	1025

Considering the results with due reference to the relative quality of the soil in different plats, the good effect of the fertilizers is not very evident. Cottonseed meal did not appear to benefit the crop to any appreciable extent, nor were the results from Phosphate and Kainit at all striking.

Nitrate of Soda appeared to benefit the crop to a slight extent, and in plat No. 7 where the three other fertilizers were used in connection with it, there was an increase in yield, over the check plat, of 289 pounds of seed cotton worth, at three cents per pound, $8.67. The cost of fertilizers applied per acre, allowing the ordinary price for them, would be $5.25, leaving a profit of about $3.40 per acre.

Corn, varieties.—Fourteen plats were cultivated in twelve varieties of corn. The land was in a valley of good productive soil, cultivated in cowpeas the previous year.

The preparation given the soil before planting was the usual fall plowing into eight foot beds, reversing and harrowing these just before planting time, and putting in the corn with a planter. The cultivations

were frequent, with the ordinary cultivators as used in the work with cotton, and no crust was permitted to form in the field or grass to grow till after the crop was laid by. The last plowing was given when the crop was in silk and tassel. While the soil appeared to be uniform there were apparent differences in the looks of the various plats during the latter part of the growing season. The yield of each variety is given below:

Yield of Varieties of Corn.

	NAME OF VARIETY.	Bushels per acre
1	Hickory King	54.5
2	Blounts Prolific	26.7
3	Champion White Pearl	45.5
4	Iowa Silver Mine	47.9
5	Mosby's Prolific	48.3
6	Ullathorn's Marlboro Prolific	52.1
7	St. Charles	45.5
8	Ullathorn's Champion EarlyWhite Dent	42.6
9	Horse Tooth	57.2
10	Early Leaming	47.4
11	Red Cob (Early Breadfield)	72.2
12	So. Snowflake	75.1
13	Marlboro Prolific	72.2
14	Mosby's Prolific	73.0

NOTES ON VARIETIES.

No. 1—**Hickory King.**—Large stalk and ear, grain white. A good variety.

No. 2—**Blounts Prolific.**—Very early, small stalk and ear, grain white. No good this year.

No. 3—**Champion White Pearl.**—A very good variety, medium stalk, white.

No. 4—**Iowa Silver Mine.**—Medium early, white ear and cob. Corn not very sound.

No. 5 and 14—**Mosby.**—Tall stalk, two to three small ears, white grain, cob small and white, grain sound. One of the best varieties grown in the State.

No. 6 and 13—**Marlboro Prolific.**—Medium early variety, good size stalk and ear, grain and cob white. A good variety.

No. 7—**St. Charles.**—Short thick ear, white grain, red cob.

No. 8—**Ullathorns Champion Early White Dent.**—Large white grain, rows uneven and bad shape.

No. 9—**Horse Tooth.**—Long white grain, white cob, good size ear, well formed. Similar to Shoepeg corn.

No. 10—**Early Leaming.**—Medium stalk, thick at ground and tapering at top. Fine ear, yellow grain, not perfectly sound. Shows by uniformity of growth and size and color of ear, good breeding.

No. 11—**Early Breadfield.**—Stalk tall and strong, good ears, white grain. A splendid variety.

No. 12—**Southern Snow Flake.**—A white corn, tall stalks, and good ears. The variety that made the best yield in the test.

Owing to the absence of fixed type characteristics in most of the varieties of corn in this test, little effort has been made to publish full notes. A few of the varieties were quite uniform and of good type, but the majority of them showed all kinds of variations as to shape of ear and grain, arrangement of rows of grains, number of rows on cob, size of ear and even some varieties as to color of cob.

The varieties are among the best grown in the south and proclaim very forcibly the great need of the corn-breeders work in this section. The seed were nearly all procured from prominent Southern seedmen.

Fertilizer test.—This experiment was similar to the fertilizer work with cotton and intended to see the effect of the fertilizers where the best possible tillage was given.

The land was in a valley and had the same winter and early spring plowings as was given to the other similar soils. It was, however, not perfectly drained and had a tendency to remain wet in the spring. It was left till May 2nd, having had no other treatment than the plowings mentioned, when a disk harrow was run over and Mosby corn planted. A stand was not secured and on May 18th the eight foot

beds were plowed again and the harrow run across them, and again planted. At the time of planting the land was in perfect condition. A good stand of corn was obtained in a few days, and it grew off in fine shape. It promised a big yield, but owing to the late date of planting the dry weather injured it severely.

The plats ran the entire length of the plat of land and consisted of two rows with an area of .064 acres. The yield of ear corn follows:

Yield of Corn—Fertilizer List.

No. of Plat	Fertilizers			Yield of ear corn lbs per plat	Yield of ear corn lbs. per acre	Yield of ear corn bushels per acre
	Cottonseed meal lbs. per acre	Nitrate lbs. per acre	Kainit lbs. per acre			
1	.....	.....	.....	250	3906	54.2
2	300	.....	.....	263	4109	57.
3	.....	150	.....	267	4172	58.
4	150	75	.....	241	3765	52.1
5	.....	.....	.....	183	2859	39.7
6	.....	.....	300	187	2922	40.5
7	.....	*150	.....	270	4218	58.5
8	.....	150	200	208	3250	45.1
9	200	.....	.....	191	2984	41.4
10	.....	.....	.....	180	2810	39.

*75 lbs. applied at planting time and 75lbs. Aug. 3rd.

In these results there seems to be no doubt that Kainit was of no benefit to the crop. Nitrate of soda and cottonseed meal were both beneficial. This was very marked in plat No. 7 where two applications of the nitrate were made. That the first check plat should have made such a yield as shown is explained by the fact that it occupied the two outside rows, with an intervening space of six feet, that was kept cultivated, separating them from a crop of cow peas. All of the corn in this test was too much crowded and these rows were very much improved by having the benefit of more ground space and sunshine.

Wheat varieties.—Nine varieties of wheat were planted during the fall of 1902 in one-twentieth acre plats. The growth was fine in all of the plats with very little rust. The yield of grain was very small

however, partly due to the depredations of sparrows and mice while in the shock awaiting the thresher.

The plats were divided and one-half of each variety cut for hay when in the milk stage, the outer half being allowed to ripen for grain.

The yield of grain and hay is given in the following table:

Varieties of Wheat.

YIELD OF GRAIN.	Lbs. per acre	Bushels per acre
Syrian Red	440	7.3
Harvest Pride	330	5.5
Blue Stem	390	6.5
Early Oakley	560	9.3
New York Red Clawson	420	7.0
New York Russian Red	604	10.0
Harvest King	610	10.2
New York Early Arcadia	130	2.2
Purple Straw	410	6.9
YIELD OF HAY.	Lbs. per acre	
Syrian Red	3600	.....
Harvest Pride	3280	.....
Blue Stem	3440	.....
Early Oakley	3600	.....
New York Red Clawson	2720	.....
New York Russian Red	2600	.....
Harvest King	3000	.....
New York Early Arcadia	2800	.....
Purple Straw	4000	.....

Fertilizer test.—One test was made with Nitrate of Soda on wheat. A plat was selected on a thin piece of soil sown in the fall of 1902. A plat was measured off representing .077 acres, and an equal area, one half on either side was taken for a check plat. The Nitrate of Soda was

applied as a top dressing the first of April, at the rate of 129 pounds per acre. The effect on the crop was marvelous both in the appearance of the wheat and in the yield of hay when compared with the check plat when harvested.

The yields were as follows:

Yield of Wheat Hay. Nitrate Fertilization.

PLAT	Area	Nitrate lbs. per acre	Yield per plat lbs. hay	Yield per acre lbs. hay
Fertilized	.077	129	150	1948
Unfertilized	.077	.....	73	948

Oats—fertilizer for.—Six plats were treated with Nitrate of Soda as a top dressing the first of April, the oats having been planted the previous fall. The land was a poor hillside and apparently very much in need of nitrogenous plant food.

The results given below indicate that it is profitable to top dress an oat crop with Nitrate of Soda early in the season, especially on thin land. Favorable seasons after the application, of course, bear an important relation to the results.

Yield of Oat Hay—Nitrate Fertilization.

Number	Area of Plat	Nitrate lbs. per acre	Yield per plat lbs.	Yield per acre lbs.
1	1-50 A.	.....	22.5	1125
2	1-50 A.	50	37.0	1850
3	1-50 A.	100	50.0	2500
4	1-50 A.	100	54.0	2700
5	1-50 A.	150	65.0	3250
6	1-50 A.	.....	35.0	1750

Cowpeas.—Our experiments with this crop have not been so extended as the importance of the plant would demand. The work as planned was to make a trial of as many different varieties as could be had, both for the production of seed and hay.

Following is the list of twelve varieties planted together with the notes made concerning them.

No. 1—**Red Ripper.**—Running variety, good bearer, still green Oct. 1st.

No. 2—**Large Black Eye.**—Slightly running, good bearer, large seed, entirely dead Oct. 1st.

No. 3—**Taylor.**—Running vines, good bearer, large sound seed, vines dead Oct. 1st.

No. 4—**Black Cowpea.**—Running, good crop peas, vines dead early.

No. 5—**New Era.**—Small seed, slightly running vines, good bearer, green Oct. 1st.

No. 6—**Iron.**—Small seed, strong running vines, medium bearer, green Oct. 1st.

No. 7—**Small Black Eye.**—Bunch variety, small seed, medium bearer, very early.

No. 8—**Gallivant.**—Very dense running vines, small white seed, very poor bearer, green Oct. 1st.

No. 9—**Southdown.**—Strong running vines, small spotted seed, good bearer, nearly dead Oct. 1st.

No. 10—**Clay Pea.**—Very similar both in seed and vine to Iron pea, except that the seed are slightly larger, green Oct. 1st.

No. 11—**Wonderful or Unknown.**—Seed larger and lighter in color than the Clay variety, irregular in shape with many defective ones in pods. Very large and strong, standing up well with runners ten to twelve feet long, poor bearer, vines green Oct. 1st.

The varieties were planted on a nice piece of rolling land, May 21st, and made a beautiful growth. In yield of peas the product ranged from nothing up to more than 15 bushels per acre, the whippoorwill variety giving much the best yield of any in the field. The trial of the varieties for hay was made on the piece of valley land from which the

varieties of wheat had been harvested. Ten varieties were planted in drills on half of this land, and the same ten varieties sown broadcast in plats on the remainder. The land was a part of the plat of ground on which the fertilized corn had been planted, referred to earlier in this report, and on which Johnson grass had a strong hold. The cultivation given the land for wheat had not killed out the grass to any extent, and when the crop of cowpeas was ready to cut there was such a dense growth of a mixture of Johnson grass and pea vines that it was impossible to separate the plats, and be able to ascertain how much of the growth should be accredited to each crop. It was consequently determined to harvest it all as one plat. The yield of hay, after being sunned in cocks for a week, was 2630 lbs. on the half acre or 2 3-5 tons per acre.

The cowpea is an unusually valuable plant to the farmer of the South, not only on account of the purpose it serves as a forage plant, but in addition thereto, because it is a great restorative crop or soil improver. This plant, like all of the leguminous family of plants, has the power of taking nitrogen from the atmosphere, and is by all odds, all things considered, the cheapest and best method of obtaining this the most expensive of the fertilizing elements.

That the constant farming of land on the one crop system, as has been the custom in Mississippi, will eventually wear out soil, is undeniable, as hundreds of fields in this state will bear evidence. On the other hand, a glance at the farming of the older countries of the world will show that land may be made to yield good crops for centuries and still not be worn out.

A chemical analysis of our "worn out" soils will show them to contain about as much lime, phosphoric acid, and potash as they ever contained, but to be very deficient in one important class of material, humus. This humus is the active, life giving principle in the soil. It makes of the soil a fit place for the growth of the myriads of germs so essential to the best performance of its functions in the growing of plants. In addition to this it has an important bearing on the water supply in the soil; furnishes nitrogen to the plant; and through its agency the unavailable plant food in the soil is brought into condition to be utilized by the growing crops. The question as to how the lands so long in cultivation in the Old World have been kept in good condition without exhausting this supply of humus is one of great importance to our farmers. The answer lies mainly in this: They have grown a diversity of crops and have constantly followed a system of rotation, in which

some legume, usually a clover, always had a place, the value of the rotation depending on the clover.

For permanent success in our farming we have got to grow cowpeas, or some other legume if a more suitable one can be found.

The value of a crop of cowpeas to the succeeding crops has been found to sometimes be as great as fifteen dollars per acre before the effect had entirely disappeared. The average of the experiments determining its benefits to the cotton crop, however, shows it to be from five to six dollars per acre. The question then comes up as to whether a crop of peas can be grown for its fertilizing effects alone, with much certainty of getting any profit out of the operation. It is a doubtful proposition, and certainly will not be, of itself, sufficient inducement to encourage farmers to put as much land in this crop as the size of their farms would demand. It becomes very evident that to grow this crop to such an extent that every piece of land on a farm will be planted in it every second or third year some use must be found for the crop. We must be able to turn it into money or its equivalent.

The whole question as we see it is about as follows: We are obliged to grow cowpeas or other legumes to preserve the fertility of the land, and for this purpose, alone, they cannot be grown as extensively as they should be. They must be utilized to their full value as feed—first, to the work stock or colts, then to the cow that furnishes the milk and butter on the farm, and finally to cattle of good quality that will make marketable meat. Just enough animals to eat the grass from the uncultivated land and consume the unsalable by-products and leguminous crops are all that is required. This, on the whole, is the extent to which Mississippi may become a cattle growing state. This all leads up to the question of growing the feed to run a farm. Can we not substitute the cowpea crop for much of the corn grown on the poor land of the state and get just as much or more feed, a better quality of manure and furthermore receive the benefit to the land from growing the cowpeas? Our work did not contemplate this point as planned, but fortunately we had three plats of land in forage crops, all on land of about the same quality, and answering the purpose in every way, except that it was too productive, perhaps, to give the cowpeas as good a chance for excelling as we believe it would have on thin soil.

The soils referred to are those mentioned earlier in the report as being in Johnson grass, varieties of corn, and in wheat followed by cowpeas. The average yield of forage from the unfertilized Johnson

grass plats, and the average of the varieties of corn and wheat, together with their values, allowing fifty cents per bushel for corn and six dollars per ton for the hays are given in the table following:

Yield and Value of Forage Crops.

CROP	Yield per acre	Value per acre
Corn	54.00 bus.	$27.00
Johnson grass Hay	4.29 tons	$25.74
Wheat hay—1.6 .. / Cowpea & Grass hay—2.6 \	4.2 tons	$25.20

When we consider that cotton is the money crop of the state and will very likely continue to be, and that crops of this class, under the system of farming that should prevail, are to be considered from the standpoint of feeds to be utilized on the farm, the market value given to these crops may not answer. They must be considered with regard to their relative worth as a means of producing motive power on the farm or of putting flesh on an animal.

We have no reliable data at hand with reference to the value of these crops in that respect, but from our observation and from a general knowledge of the science of feeding it is our opinion that there is more feeding value in the crop of wheat and cowpea hay than in either of the other two crops—not to mention the benefit accruing to the land from growing the pea crop. Both the wheat hay and the mixed cowpea and grass hay are perfect feeds in themselves, and a team will do good work on either of them when given no other feed. For dairy cattle or for young and growing stock they are unquestionably the preferable feed. Corn must be supplemented with some kind of roughness with any animals, with the possible exception of pigs, and Johnson-grass hay, which is as good as any grass hay made, must have some kind of grain or concentrated feed added to it to get good results.

Figuring on the basis that a peck of corn and fifteen pounds of Johnson grass hay is a good daily ration for mules or horses and assuming that thirty pounds of either of the other hays is equally as good a ration,

we find that two acres of the wheat-cowpea crop is equal to two and two thirds acres of the corn and Johnson grass planted so as to balance each other in the grain and hay produced, or twenty acres of the former will make feed equivalent to twenty six acres of the latter crop.

These figures, as estimated above, are not based on any experiment except as to the yield of crops; and are only given to suggest the great possibility of producing feed more cheaply and at the same time to increase the productive power of the soil by growing cowpeas.

Curing cow-pea hay.—As this subject is always of interest we give below the methods usually followed in curing the crop at the Station. The cutting is done when the crop is fully mature, which is about the time the pods begin to ripen and the foliage begins to change color.

The mowing machine blade is kept sharp and run as close to the ground as possible. If the peas are in rows the cutting can be done much cleaner and better with a very sharp hoe, and at very little additional cost.

If the weather is good, as is usually the case when the crop is ready, August or September generally, the vines are raked up the same or the following day, and put into cocks of the size that two men can handle with a fork when cured. They are left in the cocks for four or five days, being turned over once or twice during the time, then hualed to the barn or stack. In case they are put in a stack a good covering of grass hay is necessary in order to shed the water. The sides of the stack should be built straight up to prevent the waters spoiling the outside hay.

Putting in cock is desirable because the hay is then cured by the circulation of air through it, and not in the direct sunlight. Any hay is better when cured in the shade.

If the weather is damp or rainy the hay is not raked at all till cured, when it is carried directly to the place where it is to be stored. If it continues to rain for several days after cutting do not touch the hay till ready to put up, and then be sure that it is dry when packed away. This is a precaution that must be observed in storing any kind of hay—do not put up when even moist with dew or it will mould.

The crop may sometimes be lost in a protracted wet spell, but can generally be saved in such condition as to make very good forage.

Other methods are practiced in saving hay. One is to put up green and is entirely satisfactory when so packed that air can circulate freely through it. One of the methods of putting up green is to erect a stack pole and nail a strong cross piece on the pole extending to the outer edges of the stack. Put on a layer of the green vines two or three feet thick then nail on another cross piece, and so on to top of stack, finishing off with grass hay. The cross pieces prevent the vines packing down closely and at the same time allow the air to enter the stack. They can be cured and kept by this method. It is somewhat more expensive than curing in the field, as it necessitates the handling of a great amount of water in the green vines, and the cost of stack pole, cross pieces, etc., amount to something.

Johnson grass.—The growing of Johnson grass for hay is becoming an item of much importance in certain sections of the state, notably in the north-east prairie region. This grass began to attract attention about twenty years ago, chiefly as a pest on the good farming lands of the prairie region. Under the system of farming in vogue it soon spread to such an extent that much of the land had to be abandoned because of its failure to yield profits in corn and cotton. During the past ten years much of the land on which the grass has got a hold has been turned into meadows and have been yielding crops of considerable value. The yield of from one to two tons of hay per acre at the prices usually obtained for the crop ($8.00 to $10.00 per ton) while not a bonanza from a money making point of view, was much better than cotton on the same land at the prices then prevailing, especially when the cost of production was taken into consideration.

Our work on this subject as carried out consisted in thoroughly preparing a piece of good bottom soil. Applying the fertilizers, nitrate of soda and cotton seed meal, in varying amounts on different plats, sowing the seed, and finally in harvesting the crop.

Preparation of soil.—The first thing of importance with this crop as well as with all others is to properly prepare the land. The half acre of land devoted to this crop was a strip sixty feet wide. Its previous cultivation for several years had been to break it broadcast once or twice a year, and each time it was thrown from the middle to the edges, which had resulted in making the middle of the cut fully a foot lower than the outer edge. This had to be remedied by plowing to the center several times in order to give good drainage to the land, a feature that should always be observed, especially on soil inclined to be stiff. This

plowing was done during the previous fall and winter. The land was not touched after this till April when it was plowed up with a one horse plow, with the expectation of planting at once. The entire month of April being very dry the soil could not be gotten in shape for sowing such seed as Johnson grass, and a season was waited for. This came from the 12th to 15th of May. On the 18th of May the fertilizers were distributed and the land cut up with a disk harrow lapping the furrows each time. The seed were then sowed at the rate of three bushels per acre, harrowed in with a section harrow and the roller run over. A perfect stand came up in a few days and the growth was very rapid. The first cutting of hay was made July 15th fully ten days later than it should have been cut, but constant rains at this time made it impossible to cut any earlier.

The second cutting was made August 20th. Owing to the protracted dry spells, the first, in April, preventing the planting, and the other, commencing the latter part of August and continuing through the fall, only two cuttings of hay were obtained. Ordinarily three cuttings are obtained from Johnson-grass meadows.

Table giving yield of hay and fertilizers used follows:

Table Showing Yield of Johnson-grass Hay.

Number of plat	Area	Cottonseed meal lbs. per acre	Nitrate of Soda lbs. per acre	Yield 1st cutting	Yield 2nd cutting	Total yield plats lbs.	Yield per acre lbs.	Yield per acre tons
1	.0724 A.	.....	.....	350	350	700	9668	4.83
2	.0652 A.	460	.....	400	360	760	11656	5.82
3	.066 A.	.....	189	390	390	780	11818	5.91
4	.0668 A.	187	94	380	360	740	11077	5.54
5	.068 A.	.....	*184	340	330	670	9853	4.92
6	.1157 A.	.....	.....	470	400	870	7519	3.75

*Half applied at time of planting, half after first cutting.

The first cutting of hay was on Wednesday, July 15th. It was cocked up Thursday afternoon on account of a threatened rain, stood in the cocks till Saturday morning when it was torn down and hauled in

Saturday afternoon. The second cutting received about the same amount of sunning. The grass was from four to five feet high at the time of both cuttings and very rank in growth though owing to the thick stand on the land was not unusually coarse. The weights given in the table are those made when the hay was hauled in and represent somewhat higher results than would have been obtained at baling time. It did not mold in the barn, however, and was in the condition of well cured hay when put up. By deducting 20 per cent. from the weights in the table the approximate amount of marketable hay will be obtained.

This piece of soil like nearly all of our land shows a variation in quality. Plat No. 1 being the best with a gradual gradation to No. 6 the poorest. The cost of fertilizers and value of hay per acre, allowing six dollars per ton for the latter, are as follows:

	Yield per acre tons	Value per acre at $6 per ton	Increase per acre over fertilizer	Cost of fertilizer per acre	Profit per acre
Average of Nos. 1 and 6	4.29	$25.74	00	00	00
No. 2	5.82	34.92	$9.18	$4.60	$4.58
No. 3	5.91	35.46	9.72	4.72	5.00
No. 4	5.54	33.24	7.50	4.22	3.28
No. 5	4.92	29.52	3.78	4.60	.82

All of the plats yielded a fair profit on the cost of the fertilizer except No. 5 on which there was a loss of 82 cents per acre from the use of fertilizers when compared with the average of the two blank plats. Yet this plat when compared with No. 6 right by the side of it, gave a profit of $2.42 per acre on the fertilizers.

Comparing the average yield on the two blank plats with the average yield and average cost of fertilizers on the other four plats we get the following figures:

	Yield per acre tons	Value at $6 per ton	Increase over no fertilizer	Cost of fertilizer per acre	Profit per acre
Average Nos. 1 and 6	4.29	$25.74	00	00	00
Average Nos. 2, 3, 4 and 5	5.55	33.30	$7.56	$4.53	$3.03

The nitrate of soda plat gave somewhat better yields on the whole. The seasons were very favorable for getting good results with this fertilizer. After it was applied, May 18th, there was a constant supply of moisture in the soil till August 15th, giving the plant roots an opportnuity to utilize all that was applied. The cottonseed meal not being so readily available had probably not all been utilized when the dry weather set in.

While the profit from the use of fertilizers in this experiment are not great, they are ample to justify their application, provided there is a good stand of grass on the land, and some surface cultivation is given. In these experiments the amount of fertilizers used is almost double what was intended to be applied, caused by a mistake as to the area of plats. We are of the opinion that 200 pounds of meal or 100 pounds of nitrate would have given better profits.

The fertilizer results are not the most important in this experiment. That cultivation alone would produce on such land as this more than four tons of hay per acre at two cuttings is the important point, and the one that suggests how the average crop of hay on good land can be more than doubled without the use of fertilizers.

Johnson grass on cultivated land.—This subject was not a part of our experiment, but owing to the great interest attached to the handling of land on which the grass is growing and the liability of spreading it over a whole farm, we will give our experience and observation along this line during the past year. The plat of land used for the fertilizer experiments with corn, was pretty well set in Johnson grass, having been sufficiently thick to justify saving the hay from it in the fall of 1902. The crop of corn mentioned was grown without any serious trouble from the grass. The method consisted in killing the grass before the corn was planted. As detailed elsewhere in this report the

land was plowed deep in the fall, plowed again in the spring, harrowed, and finally plowed and harrowed again before planting. The grass did not interfere or increase the work to any material extent through the summer and not a half dozen bunches could be found in the plat when frost came. All of our bottom land had more or less of the grass on it the previous year, which matured a full crop of seed that were scattered over the land, yet it gave no trouble. There is very little danger of this grass spreading from seed that mature and are left in the field. The reason for this seems to be that the seed find enough moisture and warmth during the fall and winter to cause them to sprout and the cold weather of the winter kills them Cases are known in this State where the grass had been sown in the fall and a good stand obtained only to be entirely killed by the first freeze. In case some of the seed should go through the winter unhurt or seed from stock or the manure pens be scattered over the land in the spring, it is comparatively harmless the first year and as easy to kill when young as other grasses or weeds. It is the grass along the ditches in a field that is a constant menace to the land, the roots are scattered by the plow or turned out further into the field with each plowing. Yet deep, frequent and thorough plowing in the preparation of soil will not only make a crop, but will so cripple this grass as to make its presence insignificant in working a crop compared to crabgrass as it grows in some sections of the state.

Miscellaneous Crops and Experiments.

Bermuda grass.—This is on the whole the best pasture grass we have in the state, and one that will grow on any kind of soil. Since it does not seed in this latitude its propogation becomes a matter of some importance. The setting out of the roots or stubble is the method usually resorted to and one that is very satisfactory when properly done. The sod, however, is not always convenient and it becomes expensive when it has to be transported from a distance.

We planted some seed of this grass during the past spring with the view of seeing if it could be economically propagated in this way. The land was very thoroughly prepared and the seed sown May 18th. They were slow in coming up but before the end of the season in spite of a thick stand of other grasses and weeds there proved to be a very good

stand. The cost of seed is from 50 to 75 cents per pound, and four pounds per acre constitutes a very good seeding.

The seed have been tried by the Station before as a means of starting the grass, but without success, and the general opinion is that it is an unsafe method. The lack of vitality in the seed is probably one cause of so many failures. In purchasing seed one should demand that the seller vouch for their freshness.

With good seed it is not always an easy matter to get a good stand of the grass. They have so little vitality in them that the conditions for their early growth should be as good as possible. The soil should be thoroughly fined, and after the seed are sown a very light harrow or brush passed over to cover them very slightly. After this a roller or drag should be run over to press the particles of soil in close contact with the small seed. This latter operation should not be omitted unless a good rain prevents when it will become unnecessary.

Iron cowpea.—Most farmers are familiar with the fact that on certain soils the cowpea is sometimes affected with a wilt disease which stops their growth and causes the leaves to shed very early in the season. The Department of Agriculture has been studying this and the root-knot disease in the pea and have developed this variety that they hope will be able to withstand the trouble. The method followed in developing such a variety is about as follows: In any field where the blight is present a few plants can be found that are free from it. The seeds are saved from these plants and the next season planted on the same land, when more of the blight-free plants will be present. These are again saved and so on till the whole field will be without blight. Our trial of the peas was without results favorable to or against the ability of the variety to resist the disease. The plat of land where they were planted had failed to grow good crops of peas for the two or three previous years owing to the prevalence of the wilt, but on account of the very favorable weather conditions, the past season, no wilt appeared in the patch either on the Iron variety or the other varieties planted along side as checks.

Rust-resistant cotton.—It is claimed that on the same method followed in developing the wilt resisting peas, a cotton might be obtained that would resist rust.

Some seed that had been saved by Prof. Lloyd in 1902 as a start in this line were planted in comparison with other seed gathered from

plants badly affected with rust. But like the Iron pea experiment no rust appeared on any cotton in the field and no advance was made towards developing the variety. Kainit as a preventive of rust was also applied on several plats.

Millo-maize.—An acre was grown in this crop on good land. In growth it has very much the appearance of sorghum, but contains less sugar. Two good cuttings of forage were obtained and fed green to the beef cattle. The forage taken from the land was weighed each day as cut, but owing to the loss of the note-book in which the weights were recorded no records were obtained. It was about like sorghum on the same quality of soil, but as a feed the cattle, apparently, did not relish it so well, as the waste was much greater than when sorghum was fed.

Three plats of Kaffir corn were also grown, and like the millo maize did not appear to have any advantage over sorghum as a forage plant. Very few seed matured in the heads of the Kaffir corn.

Legumes and grasses.—Twenty five small plats were planted in grasses and leguminous plants most of which were furnished by the Department of Agriculture of Washington, D. C. A number of these were of vetches, clovers and beans, which the Department imported from Europe and Asia with a view of giving them a trial, hoping to find some new species or varieties that might prove valuable in this country for producing forage. The vetches and beans of this class were planted during the fall of 1902, and were without exception killed by the winter freezes. They were all planted over the last of February but none of them showed any qualities of worth.

Three varieties of Egyptian clover planted in February made a good growth, and one of them promises to be a valuable plant.

Soja beans.—This is a plant that has not been tried to any great extent in Mississippi—not to the extent, we believe that its merits would warrant. It belongs to the legume family of plants, and is consequently a restorative crop. Its growth is upright with a strong stalk, has a rich and dense foliage and is a prolific bearer of the beans. Seven varieties were grown during the past year. Six of these were of imported kinds from Japan distributed by the Department of Agriculture at Washington, D. C., for trial. Owing to their being somewhat handicapped from having been planted on thin soil no definite conclusions could be arrived at as to their relative merits when compared with the ordinary variety planted on better land. They came up to a good stand

and made a very good growth, maturing and dropping their seed in August. Owing to my absence at the time most of the seed were lost by the popping of the hulls and no determination of the yields could be made. They showed a tendency to seed well, as the stalks, after the leaves dropped, had the appearance of a bunch of seed pods.

The other variety grown was the common yellow or native variety. The seed were planted May 4th on a good piece of soil, thoroughly prepared, the rows being four feet apart. The growth made was strong and healthy through the entire season, being over four feet high and lapping in the rows when the first plat was cut for hay about the 15th of September.

The area planted in this variety was slightly less than two thirds of an acre. A part of this amounting to .307 acre was cut for hay when the pods showed signs of ripening. The cutting was done with a heavy hoe, immediately after which this crop was thrown into small piles and left for five days, being turned over once. The hay saved beautifully without losing the leaves, and was kept in a stack, capped with grass, till the present date. The yield of cured hay was 2905 pounds on the area given, making 4.75 tons per acre. The hay when hauled from the field contained 42 per cent. of moisture. The large amount of moisture present was due to the thick woody stems that had not had time to dry out.

This hay with some other of the same kind has been used by Prof. Lloyd in wintering the Station flock of sheep, and I understand from him they have done well without any other feed. We also planted another patch in this last variety of the beans on a piece of land from which oats were cut in June. They grew to over three feet high and were well covered with seed pods. The weight of the crop from this plat was lost by the one who made the weighing and consequently no results can be given. It is mentioned as showing the possibility of growing them after a crop of small grain as is the custom with cowpeas. The hay from this late crop was saved as the other and fed to some colts. It was eaten as readily as cowpea hay and appears to be just as good. The loss in feeding this hay will doubtless be comparatively great, due to the thick hard stalks of the plant. On this point we are without data. From our experience with the plant we recommend it to the farmers of the state as one in every way worthy of giving a trial.

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BULLETIN No. 85.

INSPECTION AND ANALYSES OF COMMERCIAL FERTILIZERS

ON SALE IN THE STATE.

CHEMICAL LABORATORY.

AGRICULTURAL COLLEGE, MISS.

OCTOBER, 1904.

TUCKER PRINTING HOUSE, JACKSON, MISS.

MISSISSIPPI FERTILIZER CONTROL.

INSPECTION AND ANALYSES OF FERTILIZERS

BY THE CHEMICAL DEPARTMENT OF THE

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INSPECTION AND ANALYSES OF COMMERCIAL FERTILIZERS

ON SALE IN THE STATE.

Introduction.—The following tables of analyses summarize the results of the inspection of commercial fertilizers for the season of 1903-1904. This is the fourth publication of analyses of samples collected during the season, and every purchaser in the State has had an opportunity of keeping himself accurately informed in regard to the composition of the goods supplied by the various manufacturers doing business in this territory.

As a general rule, these samples were drawn by the inspectors of fertilizers sent out by this office, though a few analyses of samples sent by dealers and farmers are included. The fertilizer inspectors are very careful to secure *representative* samples of the goods on the market. Portions are drawn from twelve to twenty bags, and carefully mixed and forwarded to the laboratory for analysis. When the analysis has been completed, it is reported to the purchaser, a copy being sent to the manufacturer. In this way prompt information in regard to any irregularities that may occur is brought to the attention of the dealers as well as the manufacturers.

Buying on Analysis.—Those who intend to purchase fertilizers during the fall and winter should examine these analyses carefully; there is more in an analysis than in a name. Other things being equal, the best fertilizers give the best analyses and high analyses have built up reputations of worth for a number of brands. The more important brands have received especial attention. The average of all analyses made is given over the guaranteed analysis, that comparison may be made at a glance.

Results of the Inspection.—This bulletin contains the analyses of 280 samples, and, of this number 15 per cent. will be found below the guarantee in one or more of the essential elements and also in the relative commercial value. Nine per cent. of all analyses made are as much as or more than two per cent. below in relative value, and six per cent. are deficient more than 50c per ton.

Of 262 analyses published last season (1902-1903) 28 or 10.68% were found below the manufacturer's guarantee. The increase of deficient samples this season may be due, in some measure perhaps, to the rush of the factories to supply the greatly increased demand. While it is true that errors may be made in almost any business, it should be gratifying to the trade in our State to note that some of our fertilizer manufacturers are so careful in the manipulation of their goods that they rarely if ever have an analysis below the guarantee. This is a high standard of excellence when we consider the difficulties of manufacture, irregular raw materials, inefficient labor, etc., so well known to the manufacturers themselves.

There seems to be little excuse, however, for the marked deficiency shown in a few of the analyses. In one or two cases, it was found necessary for the Department to require the manufacturer to withdraw questionable shipments and to supply

fresh goods of undoubted value. In other cases, the rapid sales prevented the attachment of low grade goods, but, in each case, the purchasers were notified, and a very careful inspection was maintained of the brands supplying samples giving low analyses. It is the object of the Fertilizer Control to search out irregularities and to make them public for the protection of the consumers and the careful manufacturers. In carrying out this object, we invite the co-operation of all concerned in the fertilizer trade. Only reliable goods must be placed on the Mississippi markets.

Tables of Analysis.— Table I contains all analyses made during the season, and also the *average* and the guaranteed analysis of each brand.

Table II contains the analyses of all samples found as much as or more than two per cent. below the guaranteed commercial value. Greater care is necessary in the manipulation of the goods sold under certain brand names. It not infrequently happens that an analysis will show a total commercial value above that guaranteed, while a marked deficiency will exist in one and sometimes in two essential elements. This should not be the case; the goods should conform reasonably well with the guarantee. This matter will receive especial attention during the coming season.

Fertilizer Valuations.—The following schedule of prices is used in calculating the relative commercial values given in this bulletin:

For Nitrogen	16½c per pound
For Water-Soluble Phosphoric Acid in mixed goods	5½c per pound
For Citrato-Soluble Phosphoric Acid in mixed goods	5c per pound
For Water-Soluble Phosphoric Acid in plain Acid Phosphate	5c per pound
For Citrate-Soluble Phosphoric Acid in plain Acid Phosphate	4½c per pound
For Total Phosphoric Acid in fine bone	3c per pound
For Total Phosphoric Acid in medium and coarse bone	2½c per pound
For Potash	5c per pound

Amendment to the Law.—The last Legislature amended the Fertilizer Law and this amendment is here published in full for the information of the trade.

CHAPTER 111. HOUSE BILL NO. 399.

An act to require manufacturers or dealers of commercial fertilizers offered for sale in this State to so brand such fertilizers as to indicate the constituent elements of available plant food contained therein.

SECTION 1. Be it enacted by the Legislature of the State of Mississippi, That all commercial fertilizers offered for sale in this State shall have branded on the bags or other packages containing the same either the words "high grade," the word "standard," or the words "off grade."

SECTION 2. The words "high grade" shall not appear on any bag or other package of any complete fertilizer which contains by its guaranteed analysis less than ten per cent. of available phosphoric acid, one and sixty-five-hundredths per cent. of nitrogen (equivalent to two per cent. of ammonia), and two per cent. of potash, or a grade of analysis of equal total commercial value; nor shall the words "high grade" appear upon any bag or other package of any acid phosphate and potash which shall contain by its guaranteed analysis less than thirteen per cent. of available phosphoric acid and one per cent. of potash; nor shall the words "high grade" appear upon any bag or other package of any plain acid phosphate which shall contain by its guaranteed analysis less than fourteen per cent. of available phosphoric acid.

SECTION 3. The word "standard" shall not appear on any bag or other package of complete fertilizer which contains by its guaranteed analysis less than eight per cent. of available phosphoric acid, one and sixty-five-hundredths per cent. of nitrogen (equivalent to two per cent. ammonia), and two per cent. of potash, or a grade of analysis of equal total commercial value; nor shall the word "standard" appear upon any bag or other package of any acid phosphate with potash which shall contain by its guaranteed analysis less than eleven per cent. of available phosphoric acid and one per cent. of potash; nor shall the word "standard" appear upon any bag or other package of any plain acid phosphate which shall contain by its guaranteed analysis less than twelve per cent. of available phosphoric acid.

SECTION 4. No complete fertilizer, acid phosphate with potash and nitrogen, or a fertilizer carrying acid phosphate with nitrogen or acid phosphate with potash, or plain acid phosphate, shall be offered for sale in this State, which contains less than twelve per cent. of total available plant food, viz: available phosphoric acid, nitrogen and potash, either singly or in combination.

SECTION 5. Cotton seed products are hereby exempted from the operation of this Act

SECTION 6. This Act shall take effect and be in force from and after September 1, 1904.

Approved March 22, 1904.

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	A. D. Adair & McCarty Bros., Atlanta, Ga.	
3637	Farish Furman Formula	W. L. Bourland, Amory
3669	Farish Furman Formula	H. S. Massey & Sons, Iuka
3781	Farish Furman Formula	H. S. Massey & Sons, Iuka
		Average
		Guarantee
3668	Furman's H. G. Dis. Bone	H. S. Massey & Sons, Iuka
3780	Furman's H. G. Dis. Bone	H S. Massey & Sons, Iuka
		Average
		Guarantee
	American Guano Co., Nashville, Tenn.	
3670	Mule Brand Blood and Bone	Quillin & Son, Nettleton
		Guarantee
3671	Mule Brand Cotton, Corn, and Wheat Grower	Quillin & Son, Nettleton
		Guarantee
	Armour Fertil'er Works, Atlanta, Ga.	
3638	Armour's King Cotton	W. L. Bourland, Amory
		Guarantee
3672	Fertilizer No. 921	C. W. Young, Ripley
		Guarantee
	Birmingham Fertil'r Co., Birmingham Ala.	
3639	Birmingham H. G. Acid Phosphate	Gilmore & May Co., Amory
		Guarantee
3640	Birmingham H. G. Fertilizer	Myers & Mehaffy, Steenston
3848	Birmingham H. G. Fertilizer	Gilmore & May Co., Amory
		Average
		Guarantee
	Brookhaven Progressive Cotton Oil Co., Brookhaven, Miss.	
3485	New South	Brookhaven Progressive Cotton Oil Co., Brookhaven
		Guarantee
	Sold by Blumenfeld & Fried, Ackerman, Miss.	
3557	B. & F.'s Own Mixture	Blumenfeld & Fried, Ackerman
		Guarantee
	Capital Fertilizer and Manufacturing Co., Jackson, Miss.	
3498	H. G. Acid Phosphate	Moore Bros., Morton
3569	H. G. Acid Phosphate	B. M. Brown, Kosciusko

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3637	10.12	6.78	2.24	9.02	1.56		2.34	$ 12.04
3669	10.42	8.38	2.22	10.60	.68		2.20	13.64
3781	5.50	5.42	4.08	9.50	2.58		2.94	12.98
	8.68	**6.86**	**2.85**	**9.71**	**1.61**		**2.49**	**12.89**
		7.00	*3.00*	*10.00*	*2.00*		*2.00*	*12.70*
3668	10.27	11.97	2.32	14.29	.26			14.06
3780	4.91	11.73	3.91	15.64	1.36			15.25
	8.09	**11.85**	**3.11**	**14.96**	**.81**			**14.65**
		9.00	*3.00*	*12.00*	*2.00*			*11.70*
3670	9.26	6.59	3.21	9.80	6.95	1.18	1.14	15.44
		4.00	*5.00*	*9.00*	*1.00*	*1.65*	*1.00*	*15.76*
3671	12.01	7.91	2.40	10.31	2.62	1.64	2.38	18.81
		4.00	*4.00*	*8.00*	*1.00*	*1.65*	*2.00*	*15.76*
3638	8.12	5.76	3.80	9.56	3.19	1.75	2.12	17.94
		5.50	*2.50*	*8.00*	*1.50*	*1.65*	*2.00*	*15.91*
3672	7.94	6.43	3.42	9.85	2.99	1.61	1.29	17.01
		6.50	*2.50*	*9.00*	*1.50*	*1.65*	*1.00*	*16.01*
3639	10.55	9.24	4.59	13.83	1.08			13.37
		12.00	*2.00*	*14.00*	*2.00*			*13.80*
3640	10.02	6.90	2.37	9.27	1.07	1.69	1.32	16.77
3848	13.40	7.09	2.39	9.48	1.43	1.79	2.80	18.81
	11.71	**6.99**	**2.38**	**9.37**	**1.25**	**1.74**	**2.60**	**17.79**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
3485	6.76	8.49	1.21	9.70	1.36	1.77	2.99	19.29
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*1.80*	*16.86*
3557	9.83	7.85	4.20	12.05	.87	1.66	2.20	20.43
		8.00	*1.00*	*9.00*	*1.00*	*1.64*	*1.50*	*16.63*
3498	9.00	8.11	3.37	11.48	1.41			11.14
3569	10.00	9.94	2.93	12.87	.93			12.58

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
3631	H. G. Acid Phosphate	Kelley & Woods, Kosciusko
3630	H. G. Acid Phosphate	Holmes Bros., McComb City
3849	H. G. Acid Phosphate	H. A. Brown, Weathersby
3850	H. G. Acid Phosphate	M. O. Bingham, Newton
		Average
		Guarantee
3496	Cotton Elevator	B. M. Brown, Kosciusko
3570	Cotton Elevator	R. C. Cooper, Morton
		Average
		Guarantee
3589	Mississippi Guano	Max Priebatsch, Brookhaven
		Guarantee
3495	Nonpareil	H. K. Farmer, Westville
3503	Nonpareil	M. J. L. Hoyes' Sons, Newton
3571	Nonpareil	Moore Bros., Morton
3598	Nonpareil	J. H. Collins, Wesson
3632	Nonpareil	Holmes Bros., McComb City
3633	Nonpareil	Kelley & Woods, Kosciusko
3641	Nonpareil	Lann & Carter Hard'e Co., Aberdeen.
3663	Nonpareil	Holmes Bros., McComb City
3673	Nonpareil	Hoye & Loper, Lake
3851	Nonpareil	D'Lo Mercantile Co , D'Lo
3852	Nonpareil	Turner & Co., Hattiesburg
3853	Nonpareil	W. H. Gillaspy, Hickory
		Average
		Guarantee
3674	Our Vegetable Grower	E. F. Nunn & Co., Shuqualak
		Guarantee
3482	Red Star Brand Guano	S. Aleus, Summit
		Guarantee
3497	German Kainit	Capital Fert. & M'f'g Co., Jackson
3602	German Kainit	J. W. Ray, Canton
3635	German Kainit	Capital Fert. & M'f'g Co., Jackson
		Average
		Guarantee
	CONTINENTAL FERTIL'R CO., Nashville, Tenn.	
3642	Sunny South Acid Phos.	Myers & Mehaffy, Steenston
		Guarantee
	CRESCENT CITY STOCK YARD & SLAUGATER HOUSE CO., New Orleans, La.	
3675	Pure Raw Bone	White-Brumfield Co., McComb City
		Guarantee
	EAGLE COTTON OIL CO., Meridian, Miss.	
3580	Eagle H. G. Acid Phos.	Eagle Cotton Oil Co., Meridian
		Guarantee
3579	Farm Mixture	Eagle Cotton Oil Co., Meridian
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3631	10.66	9.94	3.34	13.28	1.98			$ 12.95
3630	10.79	9.81	3.23	13.04	2.16			12.72
3849	9.60	9.56	6.06	15.62	1.02			15.01
3850	10.90	10.95	3.25	14.20	1.41			13.88
	10.16	**9.72**	**3.70**	**13.42**	**1.49**			**13.05**
		10.00	*2.00*	*12 00*	*1.00*			*11.80*
3496	9.31	6.29	2.24	8.53	2.44	1.93	2.48	17.91
3570	9.29	6.55	2.25	8.80	2.30	1.67	2.65	17.53
	9.30	**6.42**	**2.25**	**8.67**	**2.37**	**1.80**	**2.56**	**17.72**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*2.25*	*17.86*
3589	8.53	5.87	2.14	8.01	1.75	1.70	2.85	16.97
		7.00	*2.00*	*9.00*		*1.50*	*2.00*	*16.58*
3495	9.31	6.14	2.26	8.40	1.88	1.74	3.00	17.67
3503	10.43	6.29	2.58	8.87	.81	1.84	3.46	18.94
3571	8.94	6.27	1.81	8.08	2.28	1.78	3.02	17.51
3598	9.99	6.72	2.32	9.04	2.16	1.65	2.62	17.70
3632	8.95	5.24	2.30	7.54	1.07	1.71	3.45	17.07
3633	9.57	5.93	2.69	8.62	1.09	1.50	3.43	17.52
3641	9.34	6.22	3.17	9.39	1.25	1.59	3.08	18.26
3663	9.82	6.70	2.53	9.23	1.24	1.67	2.27	17.60
3673	10.12	7.18	2.91	10.09	.99	1.53	2.08	17.86
3851	11.38	5.93	2.76	8.69	1.83	1.76	2.82	17.82
3852	11.03	6.03	3.21	9.24	.61	1.45	2.80	17.35
3853	10.63	7.07	2.98	10.05	.52	1.75	2.34	18.79
	9.96	**6.31**	**2.63**	**8.94**	**1.31**	**1.66**	**2.86**	**17.84**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*2.25*	*17.86*
3674	8.98	4.71	2.35	7.06	1.65	3.00	7.21	24.50
		5.00	*2.00*	*7.00*	*1.00*	*2.50*	*5.00*	*20.63*
3482	9.38	6.14	2.39	8.53	.65	1.88	3.36	18.61
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*2.25*	*17.86*
3497	.54						10.65	10.65
3602	3.14						11.54	11.54
3635	2.27						11.83	11.83
	1.98						**11.34**	**11.34**
							12.00	*12.00*
3642	8.84	9.15	4.17	13.32	1.74			12.90
		10.00	*3.00*	*13.00*	*1.00*			*12.70*
3675	7.57				24.15	3.98		25.02
					22.31	*3.92*		*23.90*
3580	12.09	11.67	2.34	14.01	2.00			13.78
		10.00	*3.00*	*13.00*	*1.00*			*12.70*
3579	10.47	7.24	2.79	10.03	1.09	2.13	1.39	19.07
		7.00	*2.50*	*9.50*		*1.65*	*1.50*	*17.06*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	FEDERAL CHEMICAL CO., Louisville, Ky.	
3609	Daybreak H. G. Acid Phos...	Abney & Travis, Heidelberg
3647	Daybreak H. G. Acid Phos...	E. M. & W. R. Cain, Caledonia
3731	Daybreak H. G. Acid Phos...	Rumbel & Wensel, Natchez
3732	Daybreak H. G. Acid Phos...	H. C. Weems, Ellisville
3773	Daybreak H. G. Acid Phos...	Abney & Travis, Heidelberg
		Average
		Guarantee
3645	Daybreak Standard Acid Phos., with Potash No. 2..	E. M. & W. R. Cain, Caledonia
		Guarantee
3644	Daybreak Fertilizer	E. M. & W. R. Cain, Caledonia
3676	Daybreak Fertilizer	R. D. Hopper & Co., Tiplersville
3779	Daybreak Fertilizer	Rumbel & Wensel, Natchez
3854	Daybreak Fertilizer	C. V. Akin, DeSoto
		Average
		Guarantee
3646	Daybreak Fertilizer Special..	E. M. & W. R. Cain, Caledonia
		Guarantee
3844	The Complete Fertilizer	L. L. Price, Toomsuba
		Guarantee
	HAZLEHURST OIL MILL & FERTILIZER CO., Hazlehurst, Miss.	
3493	H. G. Acid Phosphate	H'hurst Oil Mill & Fert. Co., H'hurst
3592	H. G. Acid Phosphate	J. R. Gillaspy, Crystal Springs
		Average
		Guarantee
3494	Imperial Fertilizer	H'hurst Oil Mill & Fert. Co., H'hurst
3594	Imperial Fertilizer	Parson, May, Oberschmidt Co., B'khn
3855	Imperial Fertilizer	Grenada Cotton Oil Co., Grenada
3856	Imperial Fertilizer	Hyman Mercantile Co., Summit
		Average
		Guarantee
3492	German Kainit	H'hurst Oil Mill & Fert. Co., H'hurst
		Guarantee
	JACKSON FERTILIZER CO., Jackson, Miss.	
3476	H. G. Acid Phosphate	Centreville Mer. Co., Centreville
3558	H. G. Acid Phosphate	Dr. James McGovern, Ackerman
3677	H. G. Acid Phosphate	R. F. Everett, Braxton
3857	H. G. Acid Phosphate	M. D. Graham & Co., Forest
3858	H. G. Acid Phosphate	Barney-John Co., Gloster
3859	H. G. Acid Phosphate	Johnson-Woodward Co., Mt. Olive
3860	H. G. Acid Phosphate	The Lampton Co., Columbia
3861	H. G. Acid Phosphate	T. M. Heidelberg, Heidelberg
		Average
		Guarantee
3603	Chicago R. B. Superphosph'e	W. J. Granham Co., Terry
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3609	11.36	9.29	4.21	13.50	.87			$ 13.08
3647	12.54	8.92	4.46	13.38	.86			12.93
3731	13.14	10.62	3.16	13.78	1.09			13.46
3732	13.30	9.74	4.68	14.42	1.00			13.95
3773	8.88	11.72	2.81	14.53	2.10			14.25
	11.84	**10.06**	**3.86**	**13.92**	**1.18**			**13.53**
		10.00	*4.00*	*14.00*	*1.00*			*13.60*
3645	10.30	6.08	4.26	10.34	.73		2.11	13.06
		8.00	*2.00*	*10.00*	*1.00*		*2.00*	*12.80*
3644	9.42	6.55	2.89	9.44	1.13	1.40	1.44	16.09
3676	6.56	5.83	3.47	9.30	.83	1.68	1.28	16.62
3779	8.84	5.68	3.89	9.57	1.25	1.77	2.89	18.78
3854	10.59	5.10	4.02	9.12	.42	1.40	2.34	16.52
	8.85	**5.79**	**3.57**	**9.36**	**.91**	**1.56**	**1.98**	**17.00**
		5.33	*2.67*	*8.00*	*1.00*	*1.65*	*2.00*	*15.90*
3646	8.87	7.42	2.65	10.07	1.02	1.85	1.69	18.51
		6.00	*3.00*	*9.00*	*1.00*	*1.65*	*1.00*	*15.96*
3844	8.85	7.40	2.92	10.32	1.04	1.55	2.17	18.27
		6.67	*3.33*	*10.00*	*1.00*	*1.65*	*2.00*	*18.03*
3493	12.83	12.59	3.41	16.00	2.03			15.66
3592	12.28	12.46	3.18	15.64	2.19			15.32
	12.55	**12.53**	**3.29**	**15.82**	**2.11**			**15.49**
		12.00	*2.00*	*14.00*	*1.00*			*13.80*
3494	8.89	7.34	2.81	10.15	1.01	2.19	2.02	20.02
3594	10.39	8.05	2.83	10.88	1.09	1.93	2.20	20.16
3855	13.45	6.56	2.69	9.25	1.25	1.84	2.42	18.31
3856	12.22	6.90	2.76	9.66	.84	1.99	2.14	18.96
	11.24	**7.21**	**2.77**	**9.98**	**1.05**	**1.99**	**2.19**	**19.36**
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*1.50*	*16.56*
3492	8.07						12.58	12.58
							12.00	*12.60*
3476	12.71	13.18	3.20	16.38	1.66			16.06
3558	13.87	12.55	3.04	15.59	1.71			15.29
3677	15.25	12.51	2.66	15.17	1.33			14.90
3857	24.58	11.31	5.50	16.81	1.27			16.26
3858	14.42	12.37	3.43	15.80	.73			15.46
3859	15.05	11.51	3.92	15.43	2.06			15.04
3860	17.50	11.88	3.23	15.11	1.37			14.79
3861	20.57	11.96	2.80	14.76	1.79			14.48
	16.74	**12.16**	**3.47**	**15.63**	**1.49**			**15.29**
		12.00	*2.00*	*14.00*	*1.00*			*13.80*
3603	12.16	6.61	3.13	9.74	3.40	1.86	1.60	18.05
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.50*	*17.11*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
3489	Fruit and Vegetable	Lotterhos & Huber, Crystal Springs
		Guarantee
3559	Gulf States Guano	The Potts-Jackson Co., Kosciusko
		Guarantee
3478	Lampton's R. B. Superpho'e	Lampton Mer. Co., Magnolia
3610	Lampton's R. B. Superpho'e	The Lampton Co., Columbia
		Average
		Guarantee
3584	L. & H.'s Special Fertilizer	Lotterhos & Huber, Crystal Springs
		Guarantee
3504	Royal C Brand	A. C. Seavy & Son, Brookhaven
3505	Royal C Brand	J. A. Spann & Co., Pelahatchie
3560	Royal C Brand	Irving & Torbert, Wiers
3599	Royal C Brand	Lotterhos & Huber, Crystal Springs
3651	Royal C Brand	Barney-Johns Co., Gloster
3678	Royal C Brand	J. P. Myer Mer. Co., Taylorsville
3679	Royal C Brand	T. W. Pylant & Bro., Purvis
3862	Royal C Brand	J. P. Myer, Ellisville
3863	Royal C Brand	The Gaddis Slay Co., Magee
3864	Royal C Brand	J. M. Stephenson, Morton
3865	Royal C Brand	H. A. Busick, Brandon
3866	Royal C Brand	Buckley Bros., Enterprise
3867	Royal C Brand	Story & Co., Forest
3868	Royal C Brand	L. Bridgeforth, Pickens
		Average
		Guarantee
3490	German Kainit	Lotterhos & Huber, Crystal Springs
3869	German Kainit	Mullen & Owen, Durant
		Average
		Guarantee
	JEFFERSON GIN & OIL MILL, Harriston, Miss.	
3870	Fortuna	Jefferson Gin & Oil Mill, Harriston
		Guarantee
	LAUREL OIL & FERTI'R CO., Laurel, Miss.	
3506	Laurel H. G. Acid Phos.	Kervin Bros., Collins
3572	Laurel H. G. Acid Phos.	Donald Bros., Magee
3611	Laurel H. G. Acid Phos.	Travis & Satcher, Heidelberg
3871	Laurel H. G. Acid Phos.	O. W. Connor & Co., South Seminary
		Average
		Guarantee
3507	Plow Brand	Laurel Mer. Co., Laurel
3508	Plow Brand	Taylor Bros. & Nelson, Magee
3613	Plow Brand	J. P. Myer, Ellisville
3680	Plow Brand	J. P. Cox & Son, Braxton
3872	Plow Brand	W. T. Day, Mt. Olive
3873	Plow Brand	J. P. Cox & Son, Braxton
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3489	9.14	5.42	1.66	7.08	.75	3.02	4.27	$ 21.71
		3.00	*3.00*	*6.00*	*1.00*	*3.00*	*4.00*	*20.05*
3559	10.81	8.60	2.63	11.23	.70	1.90	2.18	20.45
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*17.41*
3478	10.94	6.45	3.37	9.82	3.48	1.76	1.50	17.69
3610	10.02	7.43	3.91	11.34	2.90	1.72	1.72	19.39
	10.48	**6.94**	**3.64**	**10.58**	**3.19**	**1.74**	**1.61**	**18.54**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.50*	*17.11*
3584	11.18	6.93	1.94	8.87	1.36	2.20	2.89	19.60
		6.50	*2.00*	*8.50*		*2.00*	*3.00*	*18.65*
3504	9.76	7.80	2.89	10.69	1.06	1.91	2.45	20.13
3505	10.98	8.15	2.01	10.16	1.00	1.84	1.90	18.86
3560	11.18	8.10	2.03	10.13	1.37	1.99	2.21	19.62
3599	12.23	7.96	2.05	10.01	1.70	1.94	1.82	18.93
3651	11.52	8.30	2.33	10.63	1.33	1.66	1.76	18.62
3678	14.72	6.61	2.38	8.99	1.18	1.76	2.06	17.43
3679	12.98	8.03	2.45	10.48	1.15	1.84	1.89	19.15
3862	14.83	8.00	2.04	10.04	1.79	1.72	2.03	18.46
3863	14.70	8.72	.92	9.64	1.18	1.76	1.93	18.16
3864	12.94	8.23	1.26	9.49	1.20	2.05	1.85	18.82
3865	13.35	7.94	2.73	10.67	1.10	1.62	1.71	18.44
3866	13.01	9.12	1.68	10.80	1.20	2.07	2.01	20.45
3867	13.92	7.92	1.44	9.36	.63	2.19	2.18	19.45
3868	14.25	8.83	.98	9.81	1.23	1.94	2.09	19.09
	12.88	**8.12**	**1.94**	**10.06**	**1.22**	**1.88**	**1.99**	**18.97**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*17.41*
3490	4.07						12.72	12.72
3869	1.45						12.54	12.54
	2.76						**12.63**	**12.63**
							12.00	*12.00*
3870	10.40	7.61	1.85	9.46	.60	2.19	1.56	18.90
		6.75	*2.50*	*9.25*		*1.98*	*1.25*	*17.62*
3506	11.22	11.13	2.62	13.75	1.61			13.49
3572	11.23	11.46	2.03	13.49	2.03			13.29
3611	10.82	10.78	2.88	13.66	1.85			13.37
3871	13.37	11.53	2.79	14.32	.75			14.04
	11.66	**11.23**	**2.58**	**13.81**	**1.56**			**13.55**
		11.00	*2.50*	*13.50*	*2.00*			*13.25*
3507	11.27	6.05	3.50	9.55	1.16	2.01	1.67	18.36
3508	9.82	6.68	3.36	10.04	1.19	1.97	2.18	19.29
3613	9.03	6.82	3.12	9.94	.81	1.87	1.62	18.32
3680	9.21	7.00	2.86	9.86	.95	2.02	1.67	18.80
3872	14.59	9.06	1.02	10.08	1.22	1.81	1.71	18.58
3873	12.23	9.51	.90	10.41	1.00	1.74	1.52	18.54
	10.69	**7.52**	**2.46**	**9.98**	**1.05**	**1.90**	**1.73**	**18.65**
		7.00	*2.00*	*9.00*	*1.00*	*1.80*	*1.50*	*17.05*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
3612	K. C. Mixture	Abney & Travis, Heidelberg
		Guarantee
3681	Laurel Special	R. E. Wilkinson, Poplarville
		Guarantee
	Sold by MARBACH & EAGAN. Crystal Springs, Miss.	
3585	Bat Guano	Lotterhos & Huber, Crystal Springs
		Guarantee
	MERIDIAN FERT. FACTORY, Meridian, Miss.	
3488	Meridian South'n Acid Phos.	W. B. Richardson, Newton
3561	Meridian South'n Acid Phos.	G. R. Edwards, McCool
3682	Meridian South'n Acid Phos.	J. K. Kirkland, Quitman
3683	Meridian South'n Acid Phos.	Mathews & Cotton, Iuka
3874	Meridian South'n Acid Phos.	S. H. Floyd Mer. Co., Shubuta
3875	Meridian South'n Acid Phos.	T. B. Gaddis, Morton
3876	Meridian South'n Acid Phos.	L. L. Anderson, Shuqualak
		Average
		Guarantee
3509	Meridian Blood & Bone	M. D. Graham & Co., Forest
3595	Meridian Blood & Bone	Hubbard-McGrath Co., Hazlehurst
		Average
		Guarantee
3484	Meridian Home Mixture	John McGrath & Sons, Brookhaven
3486	Meridian Home Mixture	W. H Gallaspy, Hickory
3562	Meridian Home Mixture	Seward & Gaston, Ackerman
3600	Meridian Home Mixture	The T. J. Hubbard Co., Magee
3614	Meridian Home Mixture	Sumrall Mercantile Co., Sumrall
3684	Meridian Home Mixture	A. E. Dalrymple & Co., Amory
3685	Meridian Home Mixture	W. S. Johnson & Sons, Verona
3877	Meridian Home Mixture	L. B. Tillson, Mize
3878	Meridian Home Mixture	J. H. Rogers, Pachuta
3879	Meridian Home Mixture	Philips, Hinds & Co., Booneville
3880	Meridian Home Mixture	Mathews & Cotton, Iuka
3881	Meridian Home Mixture	M. J. L. Hoyes' Son, Newton
3882	Meridian Home Mixture	J. H. Williams & Sons, Prentiss
3883	Meridian Home Mixture	McLeod & Co., Purvis
3884	Meridian Home Mixture	Hawkins-McRaney Co., Bassfield
3885	Meridian Home Mixture	W. L. Weems, Shubuta
		Average
		Guarantee
3510	Meridian Soluble Guano	M. D. Graham & Co. Forest
3591	Meridian Soluble Guano	Hubbard-McGrath Co., Hazlehurst
		Average
		Guarantee
3487	Meridian Vegetable Grower	W. H. Barron & Co., Crystal Springs
		Guarantee
3511	Hattiesburg Am. Mix. with Bone	M. D. Graham & Co., Forest
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3612	8.76	7.61	3.38	10.99	1.29	1.52	1.61	$ 18.30
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*1.50*	*16.56*
3681	9.87	5.59	1.92	7.51	1.18	3.11	4.59	22.77
		4.00	*2.00*	*6.00*	*1.00*	*3.00*	*4.00*	*20.15*
3585	25.12				8.32	4.66	.66	19.97
					5.00	*4.25*	*.65*	*16.96*
3488	16.48	12.10	2.86	14.96	.43			14.67
3561	16.28	11.60	3.07	14.67	.58			14.36
3682	17.10	10.29	4.18	14.47	.59			14.05
3683	16.00	11.01	3.31	14.32	.56			13.99
3874	17.86	11.26	3.43	14.69	.60			14.35
3875	16.23	11.71	3.85	15.56	.33			15.18
3876	13.86	10.09	4.20	14.29	.46			13.87
	16.26	**11.15**	**3.56**	**14.71**	**.51**			**14.35**
		12.00	*2.00*	*14.00*	*1.00*			*13 80*
3509	14.23	8.53	2.05	10.58	2.75	1.97	1.94	19.78
3595	14.41	7.70	2.53	10.23	2.89	1.94	2.02	19.33
	14.32	**8.11**	**2.29**	**10.40**	**2.82**	**1.96**	**1 98**	**19.56**
		8.00	*1.00*	*9.00*	*1.00*	*1.65*	*1.50*	*16.66*
3484	11.59	7.92	2.98	10.90	1.30	1.92	2.07	20 00
3486	12.28	7.07	4.61	11.68	.63	2.01	1.70	20.62
3562	12.83	7.16	3.27	10.43	2.12	1 98	2 35	19.93
3600	13.47	7.78	1.59	9.37	.56	2.34	2.63	20.38
3614	9.39	7.77	3.08	10.85	.95	2.08	1.45	19.84
3684	13.43	9.15	2.07	11.22	.83	1.81	2.37	20.39
3685	14.30	7.64	1.96	9.60	2.32	1.89	1.74	18.24
3877	11.02	7.88	3.25	11.13	.88	1.95	1.55	19.81
3878	15.53	8.20	2.80	11.00	.86	1.60	1.80	18.82
3879	12.42	8.58	3.06	11.64	.97	1.87	1.90	20.48
3880	19.88	8.01	2.89	10.90	1.27	1.87	2.51	20.29
3881	13.43	8.35	2.58	10.93	.75	1.84	1.96	19.71
3882	11.76	7.70	3.60	11.30	.74	2.00	1.68	20.25
3883	7.38	7.70	2.88	10.58	1.41	1.80	1.73	18.93
3884	11.32	8.17	2.57	10.74	1.75	1.85	1.65	19.22
3885	14.00	8.39	1.65	10.04	1.56	1.87	2.40	19.36
	12.75	**7.97**	**2.80**	**10.77**	**1.18**	**1.92**	**1.97**	**19.77**
		8.00	*1.00*	*9.00*	*1.00*	*1.65*	*1.50*	*16.66*
3510	13.36	8.43	2.36	10.79	2.03	2.17	1.70	20.39
3591	11.66	7.23	3.36	10.59	2.56	1.99	1.85	19.63
	12.51	**7.83**	**2.86**	**10.69**	**2.29**	**2.08**	**1.78**	**20.01**
		8.00	*1.00*	*9.00*	*1.00*	*1.65*	*1.50*	*16.66*
3487	11.67	6.63	1.89	8.52	1.15	2.35	7.62	24.44
		5.00	*1.00*	*6.00*	*1.00*	*2.50*	*6.00*	*20.63*
3511	13.06	8.14	2.39	10.53	1.96	2.12	1.34	19.57
		8.00	*2.00*	*10.00*	1.00	*1.65*	*1.00*	*17.16*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
3654	Meridian German Kainit	W. L. Weems, Shubuta
3886	Meridian German Kainit	M. D. Graham & Co., Forest
		Average
		Guarantee
	NEW ORLEANS ACID AND FERTILIZER CO., New Orleans, La.	
3587	Black Diamond Acid Phos.	S. Cohn & Son, Magnolia
3650	Black Diamond Acid Phos.	Robinson Mercantile Co., Centreville
3887	Black Diamond Acid Phos.	E. E. Bonner, Sandersville
3888	Black Diamond Acid Phos.	W. B. Richardson, Newton
3889	Black Diamond Acid Phos.	K. Greene, Shuqualak
3890	Black Diamond Acid Phos.	W. M. McGough, Morton
3891	Black Diamond Acid Phos.	Lann & Carter Hardw'e Co., Aberdeen
		Average
		Guarantee
3615	Crescent City Acid Phos.	W. A. Morrison, Heidelberg
3666	Crescent City Acid Phos.	H. A. James, Heidelberg
		Average
		Guarantee
3686	Blood, Bone, and Beef	J. L. Moyse & Bro., Summit
		Guarantee
3480	Blood, Bone, and Potash	McComb City Mer. Co., McComb City
3593	Blood, Bone, and Potash	Magnolia Oil M. and M'f'g Co., Mag'a
3616	Blood, Bone, and Potash	Patterson, Tyrone & Co., Prentiss
3892	Blood, Bone, and Potash	E. E. Bonner, Sandersville
3893	Blood, Bone, and Potash	J. M. Graham, South Seminary
3894	Blood, Bone, and Potash	Robinson Mer. Co., Centreville
3895	Blood, Bone, and Potash	Louis Cohn & Bros, Brookhaven
		Average
		Guarantee
3687	Dissolved Bone and Potash	T. L. Cotton, Summit
		Guarantee
3483	Economizer	Louis Cohn & Bros., Brookhaven
		Guarantee
3512	Gold Dust	W. M. McGough, Morton
3617	Gold Dust	W. A. Morrison, Heidelberg
3667	Gold Dust	H. A. James, Heidelberg
		Average
		Guarantee
3479	Goldsmith's Imp. Mixture	McComb City Mer. Co., McComb City
3513	Goldsmith's Imp. Mixture	W. E. Payne, Collins
3573	Goldsmith's Imp. Mixture	Wm. Atkinson & McDonald, Wesson
3596	Goldsmith's Imp. Mixture	Wm. Atkinson-Bacot Co., Osyka
3688	Goldsmith's Imp. Mixture	McHenry Mer. Co., McHenry
3689	Goldsmith's Imp. Mixture	W. B. Richardson, Newton
3896	Goldsmith's Imp. Mixture	Howie Bros., Morton
3897	Goldsmith's Imp. Mixture	W. A. Morrison, Heidelberg
3898	Goldsmith's Imp. Mixture	J. M. Graham, South Seminary
3899	Goldsmith's Imp. Mixture	W. M. Hyde & Co., Poplarville
3900	Goldsmith's Imp. Mixture	A. J. McKay, Braxton

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3654	4.66						12.14	$ 12.14
3886	6.47						12.04	12.04
	5.57						**12.09**	**12.09**
							12.00	*12.00*
3587	12.04	9.93	3.31	13.24	1.52			12.91
3650	12.35	9.61	3.22	12.83	2 47			12.51
3887	13.55	6.12	6.64	12.76	2.20			12.10
3888	13.93	8.66	5.26	13.92	.95			13.39
3889	13.99	7.69	5.72	13.41	1.15			12.84
3890	14.26	8.93	4.48	13.41	.47			12.96
3891	16.02	12.93	5.61	18 54	1.52			17.98
	13.73	**9.13**	**4.89**	**14.02**	**1.47**			**13.53**
		10.00	*2.00*	*12.00*	*2.00*			*11·80*
3615	12.76	7.75	3 77	11.52	3.70			11 14
3666	12 90	9.01	3.36	12.37	3.22			12.04
	12·83	**8.38**	**3.57**	**11.95**	**3.46**			**11.59**
		10 00	*2.00*	*12.00*	*2.00*			*11.80*
3686	13.31	7.51	2.09	9.60	2.17	1.64	.93	16.61
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
3480	10.70	8.99	1.79	10.78	.61	2.05	1.40	19.74
3593	7.92	5.95	3.62	9.57	3.21	2.46	1.39	19.55
3616	11.24	7.89	2.88	10.77	1.88	1.57	1.35	18.01
3892	11.47	7.38	3.19	10.57	3.11	1.43	1.60	17.56
3893	12.38	7.87	2.43	10.30	1.97	1.67	1.23	17.75
3894	13.36	7.41	2.06	9 47	2.02	1.73	1.76	17.59
3895	12.20	7.24	2.76	10.00	1.83	1.76	1.71	18.15
	11.34	**7.53**	**2.68**	**10.21**	**2.09**	**1.81**	**1.49**	**18.34**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
3687	12.45	6.67	4.22	10.89	3 43		2.31	13 87
		8.00	*2.00*	*10.00*	*2.00*		*2.00*	*12 80*
3483	9.84	8.35	1.87	10.22	1.23	2.11	2.78	20.69
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*18.16*
3512	15.13	5.73	4.07	9.80	1.78	1.73	2.04	18 04
3617	8.87	6.63	2.74	9.37	3.42	1.69	1.24	16.77
3667	10.98	6.64	3.05	9.69	2.87	1.55	1.17	16.56
	11.66	**6.33**	**3.29**	**9 62**	**2.69**	**1.66**	**1.48**	**17.13**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
3479	10.76	8.14	2.14	10.28	.99	2.01	1.98	19.61
3513	10.74	7.55	2.64	10.19	.97	2.25	1.87	20.13
3573	14.58	5.31	3.38	8.69	1.77	1.75	2.25	17.16
3596	10.43	8.33	2.10	10.43	.90	1.71	1.62	18.44
3688	10.65	8.99	2.36	11.35	2.30	1.44	1.10	18.03
3689	14.15	7.47	1.85	9.32	1.02	1.90	1.33	17.58
3896	12.70	6.20	3 28	9.48	3.70	1.42	1·83	16.55
3897	12.15	5.96	3.82	9.78	2.41	1.71	1.51	17.45
3898	12.58	7.07	2.42	9.49	1.33	1.84	1.37	17.55
3899	33.85	7.87	1.98	9.85	.51	1 86	1.50	18.19
3900	26 61	5.60	3.49	9.09	3.75	1.10	1.80	15.03

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
3901	Goldsmith's Imp. Mixture	Florence Mer. Co., Florence
		Average
		Guarantee
3690	Vegetable Grower	S. Cohn & Son, Magnolia
		Guarantee
3634	German Kainit	W. C. Wilkinson, Crystal Springs
3902	German Kainit	B. McClanahan & Co., Pelahatchie
		Average
		Guarantee
	PLANTERS' FERT. AND M'F'G CO., New Orleans, La.	
3618	Vegetable Fertilizer, "Stubbs' Formula"	Davis Bros., Ocean Springs
		Guarantee
	SOUTHERN OIL & FERT. CO., Meridian, Miss.	
3581	Southern S. G. Acid Phos.	Southern Oil & Fert. Co., Meridian
3656	Southern S. G. Acid Phos.	Southern Oil & Fert. Co., Meridian
3714	Southern S. G. Acid Phos.	Southern Oil & Fert. Co., Meridian
		Average
		Guarantee
3655	Southern 20th Century H. G. Acid Phosphate	Southern Oil & Fert. Co., Meridian
3777	Southern 20th Century H. G. Acid Phosphate	Southern Oil & Fert. Co., Meridian
3778	Southern 20th Century H. G. Acid Phosphate	Southern Oil & Fert. Co., Meridian
		Average
		Guarantee
3582	Southern St'd Cotton Grower	Southern Oil & Fert. Co., Meridian
3715	Southern St'd Cotton Grower	Southern Oil & Fert. Co., Meridian
		Average
		Guarantee
3657	Southern Superior	Southern Oil & Fert. Co., Meridian
3843	Southern Superior	L. L. Price, Toomsuba
		Average
		Guarantee
	STANDARD GUANO AND CHEMICAL M'F'G CO., New Orleans, La.	
3514	Stern's Acid Phosphate	The W. C. Ellis Co., Magee
3563	Stern's Acid Phosphate	Grunewald & Loewenberg, McCool
3619	Stern's Acid Phosphate	Burkett-Burrow Co., Columbia
3903	Stern's Acid Phosphate	Hyman Mer. Co., Summit
3904	Stern's Acid Phosphate	M. W. Buckley & Son, Enterprise
3905	Stern's Acid Phosphate	Gayden & Co., Brandon
3906	Stern's Acid Phosphate	W. A. Turner & Co., Forest
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3901	12.25	8.21	1.66	9.87	2.48	1.70	1.52	$ 17.74
	15.12	**7.73**	**2.59**	**9.82**	**1.84**	**1.72**	**1.64**	**17.79**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
3690	11.13	7.13	1.57	8.70	2.33	2.44	2.21	19.55
		6.00	*1.25*	*7.25*	*2.00*	*2.80*	*2.60*	*19.55*
3634	6.13						11.84	11 84
3902	3 53						12.10	12.10
	4.83						**11.97**	**11.97**
							12.00	*12.00*
3618	7.83	5.80	4.31	10.11	1.84	2.59	3.87	22.98
		5.00	*2.00*	7.00	*1.50*	*2.47*	*3.50*	*19.03*
3581	12.88	7.59	4.39	11.98	2.66			11.54
3656	11.19	7.82	3.95	11.77	1.77			11.38
3714	13.17	10.05	2.54	12.59	1.20			12.34
	12.41	**8.49**	**3.62**	**12.11**	**1.88**			**11.75**
		9.00	*3.00*	*12.00*	*2.00*			*11.70*
3655	12.04	9.08	4.54	13.62	2.23			13.17
3777	11.18	8.48	5.89	14.37	2.55			13.78
3778	8.88	8.48	6.84	15.32	2.60			14.64
	10.70	**8.68**	**5.76**	**14.44**	**2.46**			**13.86**
		9.00	*5.00*	*14.00*	*2.00*			*13.50*
3582	11.03	6.22	2.81	9.03	1.39	1.97	1.30	17.36
3715	10.05	6.72	3.28	10.00	1.71	1.64	1.26	17.26
	10.54	**6.46**	**3.05**	**9.51**	**1.55**	**1.81**	**1.28**	**17.31**
		6.00	*3.00*	*9.00*	*1.00*	*1.65*	*1.00*	*15.96*
3657	9.56	5.30	3.18	8.48	1.28	1.88	2.21	17.33
3843	6.89	5.30	2.65	7.95	1.33	2.73	2.04	19.39
	8.23	**5.30**	**2.91**	**8.21**	**1.31**	**2.31**	**2.12**	**18.36**
		5.00	*3.00*	*8.00*	*1.00*	*1.65*	*2.00*	*15.86*
3514	11.54	10.46	5.14	15.60	2.44			15.09
3563	13.92	12.03	3.62	15.65	2.26			15.29
3619	12.42	11.51	5.33	16.84	1.16			16.31
3903	11.00	10.52	6.26	16.78	.96			16.15
3904	13.90	10.16	6.09	16.25	.99			15.64
3905	14.10	10.40	5.88	16.28	.86			15.69
3906	11.92	11.23	5.80	17.03	.83			16.45
	12.69	**10.90**	**5.45**	**16.35**	**1.36**			**15.80**
		10.00	*2.00*	*12.00*	*1.00*			*11.80*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
3588	Blood, Bone, and Meat	Hyman Mer. Co., Summit
3620	Blood, Bone, and Meat	The Lampton Co., Columbia
		Average
		Guarantee
3564	Champion Farmers' Choice	G. Lowenberg & Co., Kosciusko
3621	Champion Farmers' Choice	Van Cleave Bros., Ocean Springs
		Average
		Guarantee
3516	Mississippi Home Guano	W. A. Turner & Co., Forest
3622	Mississippi Home Guano	Hudson & Co., Sumrall
3692	Mississippi Home Guano	Dr. C. C. Ewing, Aberdeen
		Average
		Guarantee
3691	Huggins' Special H. G. Fert.	M. J. L. Hoyes' Son, Newton
3772	Huggins' Special H. G. Fert.	J. R. Huggins, Waynesboro
3814	Huggins' Special H. G. Fert.	Wetherbee-Huggins Co., Waynesboro
3815	Huggins' Special H. G. Fert.	M. W. Buckley & Son, Enterprise
		Average
		Guarantee
3693	Standard Am. Soluble Guano	Dunn Bros., Summit
		Guarantee
3481	Stern's Am. R. B. Superphos.	C. Atkinson's Sons Co., Summit
3515	Stern's Am. R. B. Superphos.	Johnson-Woodward Co., Mt. Olive
3574	Stern's Am. R. B. Superphos.	The T. B. Bonner Co., Laurel
3597	Stern's Am. R. B. Superphos.	Hyman Mer. Co., Summit
3623	Stern's Am. R. B. Superphos.	J. H. Williams & Sons, Prentiss
3694	Stern's Am. R. B. Superphos.	Gilmore & May Co., Amory
3695	Stern's Am. R. B. Superphos.	N. R. Hosey & Co., Soso
3907	Stern's Am. R. B Superphos.	J. A. Moody, Poplarville
3908	Stern's Am. R. B. Superphos.	T. J. Hubbard & Co., Magee
3909	Stern's Am. R. B. Superphos.	Zollie Daniels, Brookhaven
3910	Stern's Am. R. B. Superphos.	W. A. Turner & Co., Forest
3911	Stern's Am. R. B. Superphos.	Hudson & Co., Sumrall
		Average
		Guarantee
3696	Vegetable Fertilizer	Fernwood Lumber Co., Fernwood
		Guarantee
3477	Ground Bone	Lampton Mer. Co., Magnolia
3912	Ground Bone	Barnes, Ruffin & Co., Columbia
		Average
		Guarantee
3590	German Kainit	C. Atkinson's Sons Co., Summit
3913	German Kainit	Dunagin & Whitaker, Laurel
		Average
		Guarantee
	SWIFT FERTILIZER WORKS, Atlanta, Ga.	
3583	Swift's Bone Meal	Wm. Atkinson & McDonald, Wesson
		Guarantee
3624	Swift's S. G. Field and Farm	Abney & Travis, Heidelberg
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3588	13.86	6.23	3.73	9.96	1.22	1.92	2.32	$ 19.14
3620	12.40	6.63	3.25	9.88	1.38	1.64	2.12	17.99
	13.13	**6.43**	**3.49**	**9.92**	**1.30**	**1.78**	**2.22**	**18.57**
		4.00	*4.25*	*8.25*	*1.00*	*1.70*	*2.00*	*16.18*
3564	11.15	7.66	2.16	9.82	1.80	1.73	1.75	17.96
3621	7.92	6.82	3.29	10.11	1.37	1.65	1.70	17.86
	9.53	**7.24**	**2.73**	**9.97**	**1.58**	**1.69**	**1.73**	**17.91**
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*1.00*	*16.06*
3516	10.96	7.69	3.25	10.94	1.32	2.06	2.35	20.75
3622	8.38	6.79	3.70	10.49	1.45	1.89	2.31	19.62
3692	11.76	6.90	3.41	10.31	.95	1.65	2.68	19.04
	10.36	**7.13**	**3.45**	**10.58**	**1.24**	**1.87**	**2.45**	**19.82**
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*1.00*	*16.06*
3691	13.17	7.38	3.09	10.47	1.39	2.74	3.98	24.09
3772	10.55	6.60	3.44	10.04	2.46	2.38	3.27	21.71
3814	12.05	6.35	3.31	9.66	2.35	2.54	2.65	21.20
3815	13.50	6.95	3.09	10.04	1.27	2.93	4.01	24.27
	12.32	**6.82**	**3.23**	**10.05**	**1.87**	**2.65**	**3.48**	**22.82**
		5.00	*3.00*	*8.00*	*1.00*	*3.29*	*4.00*	*23.19*
3693	14.23	5.64	4.48	10.12	3.48	1.82	1.73	18.33
		4.00	*4.00*	*8.00*	*1.00*	*1.65*	*1.50*	*15.26*
3481	12.22	6.13	3.78	9.91	.61	1.86	1.78	18.35
3515	12.81	6.42	3.05	9.47	1.23	2.21	1.80	19.09
3574	12.98	6.93	2.98	9.91	1.91	1.68	1.80	17.86
3597	13.44	6.73	3.11	9.84	2.19	1.53	1.70	17.19
3623	12.27	5.99	2.93	8.92	3.59	1.71	1.57	16.65
3694	14.26	6.17	4.46	10.63	2.05	1.43	1.82	17.72
3695	15.08	6.14	4.11	10.25	2.43	1.60	1.62	17.68
3907	9.82	6.23	3.88	10.11	2.30	1.26	1.34	16.17
3908	14.40	5.55	4.45	10.00	2.15	1.52	1.57	17.07
3909	15.00	6.01	3.80	9.81	2.14	1.57	1.72	17.23
3910	14.88	5.88	4.09	9.97	2.07	1.56	1.58	17.21
3911	13.50	5.85	4.06	9.91	1.73	1.54	1.63	17.14
	13.39	**6.17**	**3.72**	**9.89**	**2.03**	**1.62**	**1.66**	**17.44**
		4.00	*5.00*	*9.00*	*1.00*	*1.65*	*1.50*	*16.26*
3696	13.18	5.31	2.70	8.01	1.34	3.15	5.06	23.84
		4.00	*2.00*	*6.00*	*1.00*	*3.00*	*5.00*	*21.15*
3477	7.79				18.17	3.34		19.94
3912	11.03				13.14	2.57		14.92
	9.41				**15.65**	**2.96**		**17.45**
					18.50	*2.50*		*17.38*
3590	4.38						12.82	12.82
3913	5.56						12.54	12.54
	4.97						**12.68**	**12.68**
							12.00	*12.00*
3583	6.71				25.26	2.35		20.27
					25.00	*2.47*		*20.53*
3624	8.61	6.04	3.97	10.01	2.09		3.26	13.87
		7.00	*3.00*	*10.00*	*1.00*		*2.00*	*12.70*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
3698	Swift's S. G. Cotton Plant	Dunn Bros., Summit
		Guarantee
3699	Swift's Farmers' Home	Dunn Bros., Summit
		Guarantee
3700	Swift's S. G. Golden Harvest	J. H. Wells, Hickory
		Guarantee
3697	Swift's S. G. Red Steer	W. M. Hyde & Co., Poplarville
		Guarantee
	TENNESSEE CHEMICAL CO., Nashville, Tenn.	
3701	Ox H. G. Dissolved Bone	J. D. Anderson & Co., Mize
		Guarantee
3771	Ox Acid Phosphate	M. L. Hand, Lawrence
		Guarantee
3643	Ox Cotton Guano	Myers & Mehaffy, Steenston
3770	Ox Cotton Guano	M. L. Hand, Lawrence
		Average
		Guarantee
3708	Ox Potash Mixture	N. M. Collins, Meridian
		Guarantee
	TENNESSEE VALLEY FERT. CO., Florence, Ala.,	
3702	Dissolved Bone	J. D. Wilson, Iuka
		Guarantee
3648	Florence Fertilizer	W. L. Bourland, Amory
		Guarantee
3649	King Cotton Grower	J. J. Rogers & Son, Tupelo
		Guarantee
	Sold by THREEFOOT BROS. & CO., Meridian, Miss.	
3517	Threefoot's H. G. E. Acid Phos.	Threefoot Bros. & Co., Meridian
		Guarantee
3703	Prolific Acid Phos.	Threefoot Bros. & Co., Meridian
		Guarantee
3518	Threefoot's Imp. Mixture	Threefoot Bros. & Co., Meridian
3625	Threefoot's Imp. Mixture	Johnson-Hand Co., Ellisville
		Average
		Guarantee
	TUSCALOOSA COTTON OIL CO., Tuscaloosa, Ala.	
3914	Tuscaloosa Acid Phos.	W. W. Loftus, Steenston
		Guarantee
3915	Rust-Proof Guano	W. W. Loftus, Steenston
		Guarantee
3916	Tuscaloosa Guano	W. W. Loftus, Steenston
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3698	8.65	6.00	3.72	9.72	1.01	1.57	2.04	$ 17.46
		6.00	*3.00*	*9.00*	*1.00*	*1.65*	*1.00*	*15.96*
3699	11.21	6.95	4.73	11.68	.96		4.20	16.58
		7.00	*3.00*	*10.00*	*1.00*		*4.00*	*13.70*
3700	9.59	4.99	5.40	10.39	1.52	1.60	2.10	18.19
		5.00	*3.00*	*8.00*	*1.00*	*1.65*	*2.00*	*15.86*
3697	6.57	3.90	3.81	7.71	2.12	1.91	2.77	17.08
		5.00	*3.00*	*8.00*	*1.00*	*1.65*	*2.00*	*15.86*
3701	9.90	5.37	8.93	14.30	3.67			13.41
		10.00	*4.00*	*14.00*	*1.00*			*13.60*
3771	10.36	5.21	5.56	10.77	5.23			10.21
		8.00	*4.00*	*12.00*	*1.00*			*11.60*
3643	9.14	6.80	3.28	10 08	1.93	1.63	1.25	17.31
3770	9.88	5.01	3.03	8.04	2.02	2.30	1.94	17.96
	9.51	**5.91**	**3.15**	**9.06**	**1.97**	**1.97**	**1.59**	**17.64**
		6.00	*4.00*	*10.00*	*1.00*	*1.65*	*1.00*	*16.96*
3708	9.50	2.17	7.43	9.60	2.47		1.66	11.48
		6.00	*4.00*	*10.00*	*1.00*		*2.00*	*12.60*
								13.76
								11.80
3702	10.00	7.83	6.59	14.42	3.11			
		10.00	*2.00*	*12 00*	*1.00*			
3648	12.00	7.28	3.21	10.49	4.04	1.29	2.68	18.09
		7.00	*3.00*	*10.00*	*1.00*	*1.64*	*2.00*	*18.03*
3649	11.55	7.48	3.07	10 55	3.65	1.37	1.10	16.85
		6.00	*3.00*	*9.00*	*1.00*	*1.64*	*1.00*	*15.93*
3517	13.26	11.73	3.95	15.68	1.04			15.29
		13.00	*2.00*	*15.00*	*2.00*			*14.80*
3703	10.00	10.17	5.27	15.44	.69			14.91
		11.00	*2.00*	*13.00*	*2.00*			*12.80*
3518	13.08	8.25	2.19	10 44	2.01	1.98	2.11	19.81
3625	12 16	9.25	2 30	11.55	.91	1.65	*1.95*	19.79
	12.62	**8.75**	**2.25**	**11.00**	**1 46**	**1.82**	**2.03**	**19.82**
		8.00	*2 00*	*10.00*	*1 00*	*1.65*	*2.00*	*18.16*
3914	14.43	7.61	6 47	14.08	.81			13.43
		12.00	*2.00*	*14.00*	*2.00*			*13.80*
3915	8.37	4.25	1.76	6.01	.40	1.83	5.79	18.18
		3.00	*2.00*	*5.00*	*2.00*	*1.65*	*5.00*	*15.66*
3916	6.85	6.68	3.09	9.77	.59	1.83	2.38	18.77
		6.00	*2.00*	*8.00*	*2.00*	*1.65*	*2.00*	*15.96*

Laboratory Number	Name of Brand and Manufacturer.	Where and From Whom Collected.
3917	Warrior Guano	W. W. Loftus, Steenston
		Guarantee
	VIRGINIA-CAROLINA CHEMICAL CO., Memphis, Tenn.	
3565	Royal Acid Phosphate	J. Niles Boyd, Kosciusko
3918	Royal Acid Phosphate	Smith Bros., Learned
3919	Royal Acid Phosphate	Biloxi Milling Co., Biloxi
		Average
		Guarantee
3519	I X L Acid Phosphate	Winner & Meyer, Meridian
3626	I X L Acid Phosphate	J. P. Myer, Ellisville
3920	I X L Acid Phosphate	Barnett-Davis Supply Co., Booneville
3921	I X L Acid Phosphate	L. N. Knobles, State Line
		Average
		Guarantee
3566	Scott's H. G. Acid Phos.	Seward & Fancher, McCool
3922	Scott's H. G. Acid Phos.	Rew & McClinton, Newton
3923	Scott's H.G. Acid Phos.	S. M. Dean, Iuka
		Average
		Guarantee
3521	Royal Blood, Bone, and Potash	Donald Bros., Magee
		Guarantee
3705	Royal Animal Bone Guano	W. J. Hubbard & Son, Shuqualak
		Guarantee
3704	Royal Cotton Boll Guano	Donnell & Burnham, D'Lo
3924	Royal Cotton Boll Guano	D. V. Edwards, Summerland
		Average
		Guarantee
3653	Royal H. G. Guano	M. D. Graham & Co., Forest
		Guarantee
3567	Scott's Gossypium Phospho...	Seward & Fancher, McCool
3706	Scott's Gossypium Phospho...	F. M. Clark & Son, Verona
3925	Scott's Gossypium Phospho...	D. F. Vaughn, Magnolia
3926	Scott's Gossypium Phospho...	Mullins & Green, Amory
3927	Scott's Gossypium Phospho...	Donald Bros., Magee
3928	Scott's Gossypium Phospho...	B. B. Davis, Buckatunna
3929	Scott's Gossypium Phospho...	J. L. Buffin & Co., Vossburg
3930	Scott's Gossypium Phospho...	Grenada Mercantile Co., Grenada
		Average
		Guarantee
3568	Scott's Potasso Phospho.	J. Niles Boyd, Kosciusko
		Guarantee
3707	Scott's State Standard Guano	D. V. Edwards, Summerland
		Guarantee
3652	Mobile Double Eagle	J. P. Wetherbee, Waynesboro
3785	Mobile Double Eagle	T. J. Cole & Co., Ripley
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3917	9.45	8 03	3.81	11.84	1.18	.93	1.20	$ 16.87
		8.00	*2.00*	*10.00*	*2.00*	*.83*	*1.00*	*15.50*
3565	11.48	12.28	2.35	14.63	.45			14.40
3918	10.85	8.61	3.95	12.56	.82			12.17
3919	13.11	10.32	4.49	14.81	.96			14.36
	11.81	**10.40**	**3.60**	**14.00**	**.74**			**13.64**
		12.00	*2.00*	*14.00*	*2.00*			*13.80*
3519	12.20	12.04	1.77	13.81	1.97			13.63
3626	12.60	11.77	3.19	14 96	1.15			14.64
3920	12.17	10.39	4.24	14.63	.95			14.21
3921	11.68	10.45	3.58	14.03	1 82			13 67
	12.16	**11.16**	**3.20**	**14.36**	**1.47**			**14.04**
		12.00	*2 00*	*14.00*	*2.00*			*13 80*
3566	12.34	11.48	3.68	15.16	.72			14.79
3922	15.03	7.47	4 69	12.16	2.07			11.69
3923	15.50	9.03	4.65	13.68	.67			13.22
	14.29	**9.33**	**4.34**	**13 67**	**1.15**			**13.23**
		12.00	*2.00*	*14.00*	*2.00*			*13.80*
3521	10.31	8.30	3 07	11.37	2.72	1.00	1 00	16.45
		7.00	*2.00*	9.00	*2.00*	*1.65*	*1.00*	*16.06*
3705	9.43	6.53	2.48	9.01	1.71	1.94	1.53	17.50
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
3704	8.07	6.36	3.12	9.48	1.36	1.75	1.97	17.78
3924	10.15	5.53	2.54	8.07	2.37	1.71	2.28	16.46
	9.11	**5.95**	**2.83**	**8.78**	**1.86**	**1.73**	**2.13**	**17.12**
		6.00	*2.00*	*8.00*	*2.00*	*1.65*	*2.00*	*15.96*
3653	12.53	6.75	3.94	10.69	2.15	1.58	1.93	18.43
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*17.66*
3567	9.87	9.47	3.00	12.47	.72	1.76	1.66	20.80
3706	10.69	7.96	2.67	10.63	.63	1.84	1.69	19.10
3925	13.75	7.98	2.56	10.54	.77	1.63	1.61	18.25
3926	10.15	6.20	3.52	9.72	.74	1.68	1.75	17.55
3927	11.95	6.62	3.69	10.31	1.40	1.69	1.67	18.13
3928	12.88	7.29	4.82	12.11	.49	1.06	1.31	17.59
3929	12.45	7.96	3.42	11.38	.24	1.73	1.77	19.57
3930	11.40	7.22	4.27	11.49	.88	1.56	2.06	19.34
	11.64	**7.58**	**3.37**	**10.95**	**.71**	**1.62**	**1.69**	**18.66**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*17.66*
3568	10.20	10.41	2.47	12.88	.63		2.03	15.95
		9.00	*3.00*	*12.00*	*2.00*		*2.00*	*14.90*
3707	9.45	5.65	2.85	8.50	.44	1.89	2.20	17.41
		6.00	*2.00*	*8.00*	*2.00*	*1.65*	*2.00*	*15.96*
3652	11.76	8.84	2.31	11.15	.82	1.59	1.58	18.78
3785	9.51	6.98	3.11	10.09	.87	1.76	1.99	18.50
	10.63	**7.91**	**2.71**	**10.62**	**.84**	**1.68**	**1.78**	**18.64**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*17.66*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
3520	Mobile Standard Guano	Winner & Meyer, Meridian
3775	Mobile Standard Guano	J. J. Prince, Shuqualak
3776	Mobile Standard Guano	W. J. Hubbard & Son, Shuqualak
3931	Mobile Standard Guano	Dr. James McGovern, Ackerman
3932	Mobile Standard Guano	J. J. Prince & Co., Golson
		Average
		Guarantee
3522	Genuine German Kainit	Winner & Meyer, Meridian
3933	Genuine German Kainit	Refuge Cotton Oil Co., Columbus
		Average
		Guarantee
	WESSON COTTON OIL AND FERTILIZER CO., Wesson, Miss.	
3491	Mutual Friend Mixture	Wesson Cotton Oil & Fert. Co., Wesson
3586	Mutual Friend Mixture	J. R. Brown, Crystal Springs
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3520	10.14	6.74	1.83	8.57	1.32	1.44	2.06	15.98
3775	11.19	6.62	4.20	10.82	1.40	1.11	2.04	17.13
3776	11.70	6.75	2.83	9.58	1.48	1.26	3.06	17.41
3931	10.41	3.52	4.88	8.40	2.65	1.48	1.95	15.51
3932	11.45	5.40	3.83	9.23	4.71	1.57	2.01	16.88
	10.98	**5.71**	**3.47**	**9.18**	**2.42**	**1.37**	**2.22**	**16.43**
		6.00	*2.00*	*8.00*	*2.00*	*1.65*	*2.00*	*15.96*
3522	5.38						12.62	12.62
3933	5.15						12.16	12.16
	5.26						**12.39**	**12.39**
							12.00	*12.00*
3491	6.84	7.09	3.91	11.00	1.45	2.14	2.17	20.83
3586	6.72	7.47	3.32	10.79	1.34	2.11	2.07	20.47
	6.78	**7.28**	**3.62**	**10.90**	**1.39**	**2.12**	**2.12**	**20.65**
		7.00	*2.50*	*9.50*		*1.80*	*1.60*	*17.65*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	A. D. Adair & McCarty Bros., Atlanta, Ga.	
3637	Farish Furman Formula	W. L. Bourland, Amory
		Guarantee
	Birmingham Fert. Co., Birmingham, Ala.	
3639	B'ham H. G. Acid Phos.	Gilmore & May Co., Amory
		Guarantee
	Capital Fert. & M'f'g Co., Jackson, Miss.	
3498	H. G. Acid Phosphate	Moore Bros., Morton
		Guarantee
3632	Nonpareil	Holmes Bros., McComb City
3852	Nonpareil	Turner & Co., Hattiesburg
		Guarantee
3492	German Kainit	Capital Fert. and M'f'g Co., Jackson
3602	German Kainit	J. W. Ray, Canton
		Guarantee
	Federal Chemical Co., Louisville, Ky.	
3609	Daybreak H. G. Acid Phos.	Abney & Travis, Heidelberg
3647	Daybreak H. G. Acid Phos.	E. M. & W. R. Cain, Caledonia
		Guarantee
	New Orleans Acid and Fertilizer Co., New Orleans, La.	
3615	Crescent City Acid Phos.	W. A. Morrison, Heidelberg
		Guarantee
3900	Goldsmith's Imp. Mixture	A. J. McKay, Braxton
		Guarantee
	Southern Oil & Fert. Co., Meridian, Miss.	
3581	Southern S. G. Acid Phos.	Southern Oil & Fert. Co., Meridian
3656	Southern S. G. Acid Phos.	Southern Oil & Fert. Co., Meridian
		Guarantee
3655	Southern 20th Century H. G. Acid Phosphate	Southern Oil & Fert. Co., Meridian
		Guarantee
	Standard Guano & Chemical M'f'g Co., New Orleans, La.	
3772	Huggins' Special H. G. Fert.	J. R. Huggins, Waynesboro
3814	Huggins' Special H. G. Fert.	Wetherbee-Huggins Co., Waynesboro
		Guarantee
3912	Ground Bone	Barnes-Ruffin & Co., Columbia
		Guarantee
	Tennessee Chemical Co., Nashville, Tenn.	
3771	Ox Acid Phosphate	M. L. Hand, Lawrence
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3637	10.12	6.78	2.24	9.02	1.56		2.34	12.04
		7.00	*3.00*	*10.00*	*2.00*		*2.00*	*12.70*
3639	10.55	9.24	4.59	13.83	1.08			13.37
		12.00	*2.00*	*14.00*	*2.00*			*13.80*
3498	9.00	8.11	3.37	11.48	1.41			11.14
		10.00	*2.00*	*12.00*	*1.00*			*11.80*
3632	8.95	5.24	2.30	7.54	1.07	1.71	3.45	17.07
3852	11.03	6.03	3.21	9.24	.61	1.45	2.80	17.35
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*2.25*	*17.86*
3497	.54						10.65	10.65
3602	3.14						11.54	11.54
							12.00	*12.00*
3609	11.36	9.29	4.21	13.50	.87			13.08
3647	12.54	8.92	4.46	13.38	.86			12.93
		10.00	*4.00*	*14.00*	*1.00*			*13.60*
3615	12.76	7.75	3.77	11.52	3.70			11.14
		10.00	*2.00*	*12.00*	*2.00*			*11.80*
3900	26.61	5.60	3.49	9.09	3.75	1.10	1.80	15.03
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*16.06*
3581	12.88	7.59	4.39	11.98	2.66			11.54
3656	11.19	7.82	3.95	11.77	1.77			11.38
		9.00	*3.00*	*12.00*	*2.00*			*11.70*
3655	12.04	9.08	4.54	13.62	2.23			13.17
		9.00	*5.00*	*14.00*	*2.00*			*13.50*
3772	10.55	6.60	3.44	10.04	2.46	2.38	3.27	21.71
3814	12.05	6.35	3.31	9.66	2.35	2.54	2.65	21.20
		5.00	*3.00*	*8.00*	*1.00*	*3.29*	*4.00*	*23.19*
3912	11.03				13.14	2.57		14.92
					18.50	*2.50*		*17.38*
3771	10.36	5.21	5.56	10.77	5.23			10.21
		8.00	*4.00*	*12.00*	*1.00*			*11.60*

Samples Found Two Per Cent. or More Below

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
3708	Ox Potash Mixture	N. M. Collins, Meridian
		Guarantee
	TUSCALOOSA COTTON OIL CO., Tuscaloosa, Ala.	
3914	Tuscaloosa Acid Phos.	W. W. Loftus, Steenston
		Guarantee
	VIRGINIA-CAROLINA CHEMICAL CO., Memphis, Tenn.	
3918	Royal Acid Phos.	Smith Bros., Learned
		Guarantee
3922	Scott's H. G. Acid Phos.	Rew & McClinton, Newton
3923	Scott's H. G. Acid Phos.	S. M. Dean, Iuka
		Guarantee
3931	Mobile Standard Guano	Dr. James McGovern, Ackerman
		Guarantee

the Guaranteed Relative Commercial Value.

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3708	9.50	2.17	7.43	9.60	2.47		1.66	11.48
		6.00	*4.00*	*10.00*	*1.00*		*2.00*	*12.60*
3914	14.43	7.61	6.47	14.08	.81			13.43
		12.00	*2.00*	*14.00*	*2.00*			*13.80*
3918	10.85	8.61	3.95	12.56	.82			12.17
		12.00	*2.00*	*14.00*	*2.00*			*13.80*
3922	15.03	7.47	4.69	12.16	2.07			11.69
3923	15.50	9.03	4.65	13.68	.67			13.22
		12.00	*2.00*	*14.00*	*2.00*			*13.80*
3931	10.41	3.52	4.88	8.40	2.65	1.48	1.95	15.51
		6.00	*2.00*	*8.00*	*2.00*	*1.65*	*2.00*	*15.96*

Mississippi Agricultural Experiment Station.

BULLETIN No. 86.

INSECTS INJURIOUS TO PECANS;

A PRELIMINARY REPORT.

By GLENN W. HERRICK.

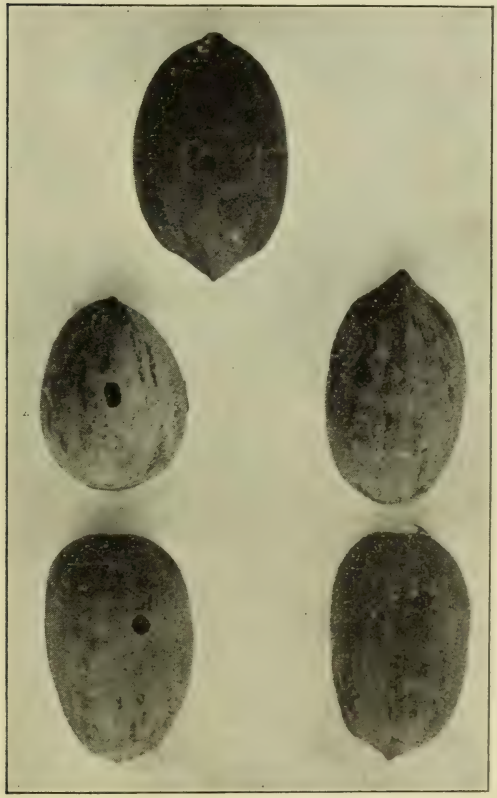

FIG. 1.—Pecan nuts showing holes through which "grubs" have issued.

AGRICULTURAL COLLEGE, MISS.,
NOVEMBER, 1904.

TUCKER PRINTING HOUSE, JACKSON, MISS.

INSECTS INJURIOUS TO PECANS.

During the last three years we have had so many inquiries concerning insects injurious to pecan trees and nuts, and pecan growing has assumed so much importance in this state within the last ten years and promises to become so much greater in the near future, that we deemed it of considerable value to investigate the life histories and habits of insects injurious to this tree and its fruit. Of course the notes presented here are in no sense complete, yet it was thought best to present the results of our work for the benefit of those interested. No attempt is made to present the insects in the order of their importance but rather as they came to our notice and were investigated.

THE PECAN PRUNER

(*Oncideres texana Horn.*)

While inspecting nurseries in Biloxi and Ocean Springs, Mississippi, the writer noted that the branches of many pecan trees in the nursery rows were cleanly severed, as though by some insect, probably a beetle. On further investigation a puncture in the bark just beneath each bud on the severed portion was evident. In the majority of these punctures were found minute eggs, from which larvae and pupae of *Oncideres texana* Horn, have been reared and observed for nearly two years.

Mr. James Brodie of Biloxi, has aided me greatly in observing the habits of the adults and in sending me material. I shall frequently quote Mr. Brodie's own words.

So far as the writer is aware nothing has been recorded in regard to the life history of this beetle.

Dr. Riley has contributed several short articles to the American Entomologist on *O. cingulata* which, however, are incomplete and hence the following notes may be of interest.

Eggs.—These were imbedded between the bark and wood in perforations made by the female beetle. The opening was closed by a gummy secretion. The eggs are about two and one half millimeters in length, of a whitish color, and oval in shape. Those under ob-

servation were laid in October of 1900 and hatched in about one month. The time of hatching is not definitely known because we were anxious to rear the adults and so did not like to examine the eggs and thus

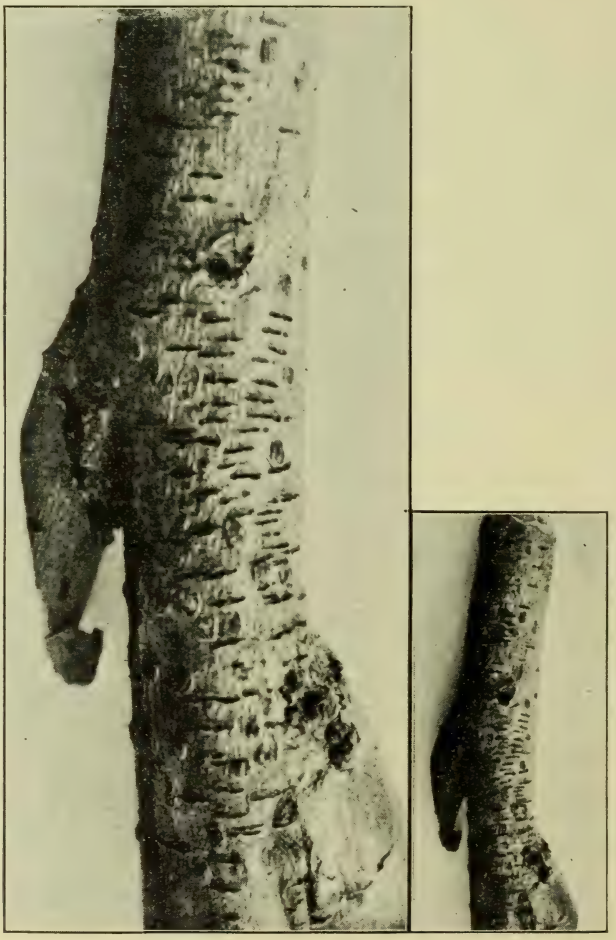

Fig. 2.—Portion of severed pecan twig showing scars made by female beetle. Enlarged at left, natural size at right.

destroy them. Each egg is laid beneath a bud and rarely beneath a small branch if it be not more than one year old.

In every case coming under my observation or that of Mr. Brodie, a peculiar scarring of the bark from the egg down the branch for two or three inches was found. The female, after laying her eggs, digs,

with her mandibles, transverse shallow grooves one-sixteenth to one-eighth of an inch long in the bark, along the probable course of the burrowing larva (fig. 2). These grooves are close together and give to the bark its peculiar scarred appearance. No doubt, it is done to deaden the bark and prevent growth from crushing the egg. Where an egg is laid beneath each bud, the series of grooves often extend from bud to bud. Thus the whole severed portion may be scarred. Dr. Riley mentions nothing of the kind in regard to *O. cingulata*, and we conclude that the species differ in this particular.

So far as observed, the eggs are laid only in the severed portion of the branch and I should expect this to hold in every case.

Larvae.—These are white in color and from one-half to three-fourths of an inch long. They vary much in size. In the first place, I judge those destined to produce females are larger than the others. In the second place a difference in the amount of nutriment obtained, no doubt, has something to do with the variation.

When looked at with a lens, the body is found to be sparsely clothed with very short, dark hairs. The mouth parts are black and protrude. After hatching they soon burrow a little distance into the wood and remain there until warm weather. During the following spring and summer they excavate galleries in the dead branch just beneath the bark. Occasionally, one is found burrowing in the solid wood. They grow rather slowly and apparently little wood satisfies them. In one branch, three-eighths of an inch in diameter, two larvae came to maturity in galleries not over five inches long. Of course the two galleries occupied nearly the whole branch, only the thin bark and a thin partition wall remaining.

The larvae exist in these cut-off branches one year in most cases and then pass into the pupal stage within the gallery. Some larvae certainly pass another winter in the branches. These are evidently those that for some reason have not grown rapidly, owing, possibly, to insufficient nutriment. Among several branches examined in January, two larvae were found that had not changed to the pupal form. They were not over two-thirds grown and most certainly will remain as larvae until warm weather.

Before the larva changes to a pupa, it cuts a pinhole in the bark near the end of the gallery, and closes up the opening of the burrow behind with long thread-like shavings (fig. 3). The pupal cell is

thus furnished with an opening to the outside for air and egress when the proper time comes.

Pupae.—On account of my intense desire to obtain the adults, the larvae were disturbed as little as possible and consequently the

Fig. 3.—Pupa in cell.

exact time of change to the pupal form is not known. It was some time between October 12 and November 12, 1901. On the former date, two were examined and found still in the larval state. On the

latter date they were pupae. This gives approximately one year in these two cases for the development of the larvae.

The pupae are also white with short, dark-colored spines on the dorsal sides of segments. They vary from seven-sixteenths to five-eighths of an inch in length and lie in burrows, in most cases, as described above, until sometime during the following summer. The pupae under observation at this time, January, 1902, developed from eggs laid in October, 1900, have not changed to the adult form, with one exception, and can hardly be supposed to do so until warm weather. The one exception noted was the case of a pupa that had attained the adult form in the autumn but for some reason was not able to issue from its cell and, therefore, died. So it is possible that in some cases one year may complete the life history.

In the month of October I found many larvae in branches of oak and the adults were then depositing their eggs in a tree near by. This fact puzzled me at the time but when I learned that the pupae lived over another season it became plain that these were adults of last year's larvae.

Adults.—These are grayish beetles from one-half to five-eighths of an inch long. The male is the smaller and has longer antennae.

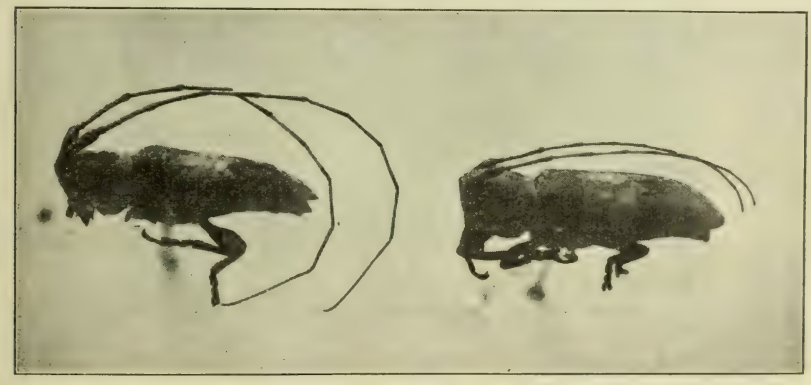

Fig. 4.—Male pecan-pruner at left and female pecan-pruner at the right.

The antennae of the female are only slightly longer than the body, while those of the male are considerably longer. The wing covers are marked with irregularly roundish, red spots. The middle third (approximately) of each wing cover is rather densely clothed with gray hairs which give this part a distinctly grayish appearance. The

proximal (especially) and the distal thirds are less densely clothed, hence darker in color. The thorax is light gray but the vertex of head and the face are covered with reddish hairs. See figure 4.

Habits of adults.—It is evident from continued observation that these beetles almost invariably work in pairs. Mr. Brodie says:

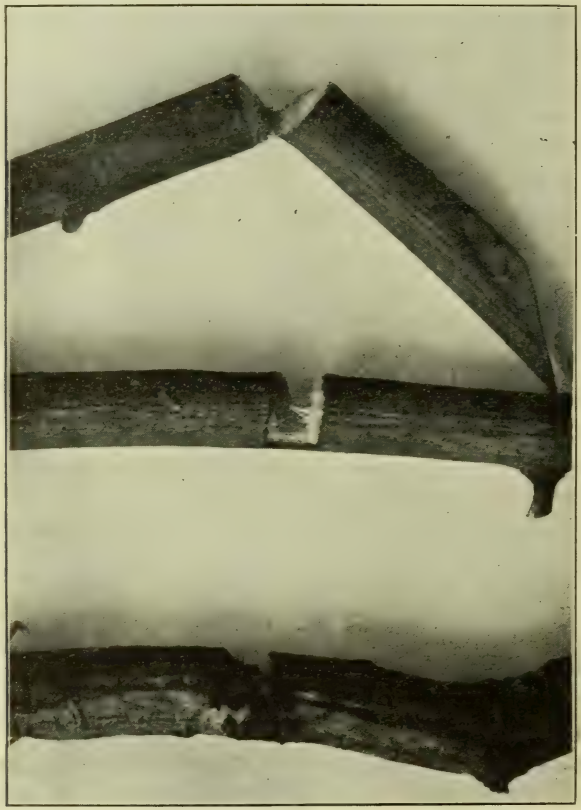

Fig. 5.—Branches showing the work of female in cutting them off.

"The result of further observation keeps me convinced that they work in pairs. The male is the smaller, and the fact that I frequently find them copulating proves they are in pairs. If the male is not in company with the female he is not far away. I invariably find him at the point or base of the branch the female is sawing. She takes frequent intervals of rest and then they are together and frequently while the female is at work the male is there but in no sense helping

or interfering in the work. I have found solitary females working but it was the exception." The female does all the work. After she selects a branch, she stands on it head downward and clasps it firmly with the fore legs. The manner of cutting is described by Mr. Brodie as follows: "In starting work, a patch the desired width of cut is cleaned and the bark eaten. Then the powerful mandibles are brought to work on the wood. A cut is first made at the top, then the head moves gently down to the bottom, where a corresponding cut is made; then working from the bottom cut, the wood fiber is raised and as the piece was cut free to start with at the top it is already detached when the piece is torn loose to the top cut. Then another cut is made at the top; then at the bottom, and so on till the insect reaches in as far as it can conveniently. It then moves to either side of this cut, eats off another strip of bark and goes to work on the wood as before." See figure 5 for stages of this work.

Strange to say, the cutting in all actually observed cases is done before the eggs are laid. Sometimes enough wood is left to support the branch but often it falls over before the eggs are deposited. This cutting off of the branch is evidently to prevent growth from crushing the eggs and to provide suitable food for the larvae. In one case where sufficient wood was left for circulation of sap, the eggs were found crushed between the bark and wood.

Dr. Riley infers that the twigs are cut off by *O. cingulata* to keep them on the damp ground where the eggs will remain moist. In the case of *O. texana* I found several branches containing one-year-old larvae that had lodged in the branches of a thick, bushy oak from which they had been cut. These were healthy, vigorous larvae and changed to pupae later. Of course these larvae had never touched the ground.

History of a single pair..—During the autumn of 1901, Mr. Brodie had the good fortune to be able to observe day by day the work of a single pair and the report is here given in his own words: "Possibly the work started September 28. I found them November 5. Then three branches had been cut. Day by day the work went on. The trees they selected were in a nursery row—three-year-old pecans. Nearly all the eggs were deposited in the two-year-old wood. The whole season's work was limited to an area of twenty-five feet by four feet. Six trees were used and, from these, nineteen branches were cut. In the nineteen branches I counted a deposit of one hundred and fifty-seven eggs. These insects remained in company over three weeks.

Then the male disappeared and no other returned. Possibly his season of usefulness was passed or he met an enemy. One feature that taxed my patience, was their selection of the best budded trees in preference to the seedling trees standing with them in the same row. December 15 we had a sharp freeze and I surmised that the life work of the female might be ended. Sure enough I found her near the root of the tree on the ground frozen stiff. I held her some time in my warm hand but there was no recovery. Then I held her in my clasped hands and breathed on her 'the breath of life,' and she once more became a living beetle. I left her as comfortable as possible but the shock was too great for her recovery. December 16 we had 14° to 16° freezing and that morning I found a dead beetle."

Distribution of this beetle.—This species is probably quite widely distributed over the Southern States. I have no data showing its northern limits. We have taken it in the southern part of this State and have reports of its occurrence as far north as Jackson and Canton, Miss. Mr. Herbert Post, of Fort Worth, Texas, writes me that he does not consider it a serious pest as the work of the beetle is in the nature of pruning. In Ocean Springs, Miss., I have seen it so abundant in a young pecan orchard that it must have been of considerable damage to the trees. The pruning is not a judicious one since they cut off the ends of so many productive branches.

Dr. Riley, answering a correspondent from Arcola, Louisiana, in 1868 in regard to the girdling and breaking off of branches in a young pecan orchard attributes the injury to *O. cingulata*. He did not see the insect. In the light of recent investigations we are inclined to think it was *O. texana*.

Dr. D. S. Phares, at Woodville, Miss., in 1869 found branches of pear and hickory cut off by an insect and found the larvae burrowing in the branches. From his drawing Dr. Riley judges the insect to be *O. cingulata*. No doubt, this was also, *O. texana*.

If we can reasonably believe that the above injuries were caused by *O. texana* then we know it has been a pest of long standing in Mississippi and Louisiana.

Food plants.—We have found the beetles working on oak, hickory, and persimmon in addition to pecans.

Prevention.—This insect can be easily controlled, it seems to me, by picking up the severed branches and burning them in the autumn. It must be remembered, however, that all the branches containing

eggs do not fall to the ground. Some are never wholly cut off, but even these topple over and can be easily detected. Others are cut off but lodge in the tree. Care should be exercised to get all the branches, those in the tree as well as those on the ground.

THE PECAN-TREE BORER.

(*Sesia scitula* Harris.)

It has been found that pecans, in the majority of cases, do not come true to seed. So it has become desirable, and in fact necessary, to bud and graft them if one wishes to secure a variety true to itself.

Fig. 6.—Moths of the pecan-tree borer. Female above and male below.

Pecan trees are among the most difficult of trees to graft or bud. There is always a large percentage of loss, among buds especially. In addition to the loss through ordinary channels we now have an insect enemy with which to contend. It is an insect which up to this time, has been of very little economic importance but its relatives, among which, are the peach-tree borer, the squash-vine borer, the currant borer and others, are notoriously bad. Very little is known of the life history and habits of *Sesia scitula* (fig. 6).

Description of this insect.—The adult form is a beautiful clear-winged moth resembling the parent moth of a peach-tree borer. The moths resemble wasps and, no doubt, are often mistaken for them. The wings are clear and the body and legs are marked with yellow all of which add to the similarity to wasps. The body of the parent female moth of the pecan-tree borer, including the tuft of hair on the end of the abdomen,is about three-eighths of an inch long and is blue-black in color. On each side of the thorax between the wings is a yellow line and there are also two yellow bands on the back of the abdomen. The hind band is wider than the front one. On the end of the abdomen is a tuft of hairs edged with yellow on each side. The wings of both male and female moths are equally devoid of scales and expand about four-fifths of an inch. The female is larger in every way than the male (fig. 6.).

Technical description of the adult moths.—Dr. Wm. Beutenmüller, in his monograph of the Sesiidae, gives the following technical description of the male and female moths of *Sesia scitula*, Harris.

MALE.—*Head and antennae black; palpi yellow, tip black; orbits white. Thorax deep blue black with a yellow line on each side and a yellow patch on each side beneath. Abdomen deep blue black with a narrow yellow ring on the second and fourth segments, the latter covering the whole segment beneath. Anal tuft black. At the base of the abdomen is a yellow line reaching to the end of the second segment. Femora blue black, tibiae yellow with a purple band on the middle and hind femora. Anterior coxae yellow. Fore wings transparent, borders and discal mark blue black, narrow; outer margin broad, with yellow rays. Underside brighter than the upper. Hind wings transparent, margins very narrow, blue black.*

FEMALE.—*Similar to the male, but heavier. The palpi are wholly yellow and the fourth segment is yellow above and below; the fifth and sixth are yellow beneath; on the fore wings the yellow between the veins of the outer border is more distinct and the anal tuft is yellow at the sides.*

Expanse; male and female, 18--22 *mm.*

Injuries of the pecan-tree borer.—The peach-tree borer confines itself almost exclusively to that part of the trunk just below the ground and to the roots of the peach tree. "Occasionally a borer is found in the trunk above ground." From my observations on the habits of the pecan-tree borer I have come to the conclusion that it invariably works in the trunk and branches above ground, thus differing decidedly from the peach-tree borer. In the spring of 1901 I received several one year old pecan buds that had been literally eaten up by the larvae of *Sesia scitula*. The inner bark and sapwood had been channeled out and destroyed, both above and below the bud and under the bud itself. Figure 7 gives an idea of the work of this borer.

A correspondent says that they are especially injurious to the buds on large trees. That is, where the limbs of a large pecan tree are cut back and then budded, the buds are severely attacked by this insect and in order to save the buds he says they require constant inspection. In smaller plants very few of the borers are found.

Unfortunately, the attacks of this insect have not been confined

to the buds of pecans. Mr. W. M. Scott, formerly the State Entomologist of Georgia, writes me as follows concerning the work of this clearwing in that State. He says "my attention was first called to the destructive work of *Sesia scitula* by a request to inspect a large pecan grove at Albany, Georgia, in the spring of 1901. On visiting the grove I found that the destruction of a number of trees was threatened by the pest and in fact large limbs had been completely girdled and the trunks of large trees were partially girdled by the accumulative work of these borers. Treatment was suggested and the trees were carefully gone over and the borers cut out so far as practical."

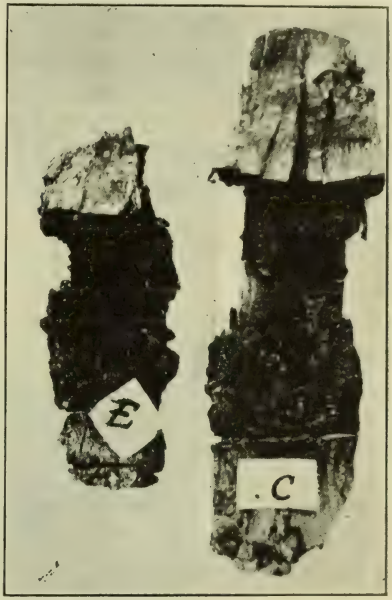

Fig. 7.—Two newly set buds completely destroyed by the larvae of Sesia scitula.

In a young pecan orchard near Starkville, Miss., in which the trees average three and four inches in diameter I found many of the trees girdled by this insect. Fortunately the grooves made by these borers usually ran in a spiral direction up the trunk, thus not severing the connection of the bark. In some cases, the deep grooves eaten out by the larvae, caused the part of the tree above to stop growing while new branches would start up from the trunk near the base; and, in order to save the tree, the part above the girdle had to be cut away to allow one of the sprouts to form a new trunk. In a few cases the trees had been broken off above the girdled places, either by the wind or by cattle rubbing against the trunks. Strange to say, the attacks of the insects were confined to one season and it has not been observed in this particular orchard since.

From my own observations it would seem that the larvae in attacking a tree select some injured spot or some spot which has been freshly cut, like a newly inserted bud. So far as I am aware the borers were confined entirely to the buds on trees at Biloxi, Miss. In the

young orchard spoken of above, the trees had evidently been injured, in some way, at the places where the borers had entered.

Life history.—Very little is known of the life history of this insect so far as I am able to find. It is probable that the eggs are deposited by the female moth on the bark of a tree near a fresh wound in the bark. For example, near newly set buds. The eggs hatch and the larvae bore into the bark and there live for a time eating out the soft inner bark and tender wood. It is certain that the borers live in these situations over winter and change to pupae in the spring, from which the moths emerge in April. The moths I reared appeared April 3, 4, and 6. The pupae are in cocoons just under the bark (fig. 8). The cocoons are made from excrement and bits of bark that have been fastened together with silk similar to the cocoons of the peach-tree borer. Whether these moths, that emerge in the spring,

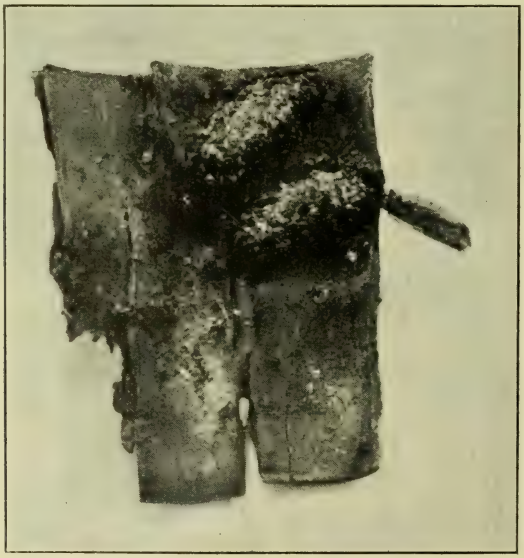

Fig 8.—Two cocoons of the pecan Sesia on the under side of the bark.

lay eggs and produce a brood in the summer that in turn develops a fall brood of larvae I am unable to say. Mr. W. F. Fiske of Georgia found nearly mature larvae early in August, which Mr. Scott says "suggests the probability of a second brood."

Distribution of Sesia scitula.—Its distribution heretofore

has been given as Canada, New England, Middle States to Virginia and westward to Ohio and Illinois. Of course now we shall have to include Georgia and Mississippi and very likely all the Gulf States.

Different names under which this insect has been written about.—A considerable variety of names has been applied to this insect by former writers. It has been written about under the following names: *Trochilium hospes, Trochilium scitula, Trochilium gallivorum, Aegeria gallivora, Aegeria scitula, Aegeria hospes, Aegeria aemula, Sesia gallivora, Sesia hospes, Sesia aemula, and Sesia scitula.*

Food plants.—Dr. Beutenmüller in his beautiful monograph records it as occuring on oak, chestnut, dogwood and probably on hickory and willow. Its favorite food plant seems to be the dogwood.

Remedies.—It will be readily seen that the problem of protecting buds from the ravages of these borers is a difficult one. The wound made by cutting the bark offers a specially desirable place for the larvae to enter. It seems to the writer that the bud might be given a coating of some substance that would close up the wound and prevent the moth from depositing her eggs. It is possible that grafting wax would answer the purpose. If ordinary coal tar did not prove detrimental to the bud and tree, it might be a good repellant. I would advise careful use of this substance, however, because I am not sure of its effect on the tree.

There remains the final remedy of digging the borers out. This is the remedy so universally used against the peach-tree borer. The buds will have to be closely watched from day to day and the borers removed as soon as discovered.

It is evident from the habits of this insect, that special pains must be taken to prevent injury to the trees, especially while cultivating them. The plow, harrow, cultivator, and other tools used in cultivation must be kept from knocking the bark off the trees. Horses should not be allowed to rub their hames against the trees while plowing or harrowing. If a tree is injured the wound should be sealed over with wax or with fresh cow manure and bound tightly with rags.

THE PECAN CATOCALA.

(Catocala viduata Guen.)

There are often found on pecan trees in the early spring, large, grayish caterpillars ravenously devouring the fresh tender leaves.

Occasionally these caterpillars occur in considerable numbers and their presence is always revealed by the ragged and half eaten leaves and bare stems. They are exceedingly ravenous feeders and defoliate the trees while in tender leaf.

When disturbed, these caterpillars are very active, squirming and flopping about like a fish out of water. They remind me strongly, in their movements of the dark colored caterpillars,—*Ceratomia catalpae*.—so common in this state on catalpa trees.

The full grown larva is from two to two and one-half inches long. The body, in general, is dark, greyish green, with various markings of darker and lighter greens which give it a remarkable resemblance to the bark of the pecan trees on which it is found resting when not eating. The color of the caterpillar presages well the color of the adult.

The Life history.—The pecan catocala is a moth and belongs to the family of moths and butterflies and like all other members of this family it has four distinct stages in its life history,—egg, larva, or caterpillar, pupa, and adult.

Egg.—We can say nothing of the eggs except to surmise that they are laid near, if not upon, the leaves.

Larva.—This is the caterpillar which we have already discussed, as causing the injuries to the pecan tree by eating the leaves. Unfor-

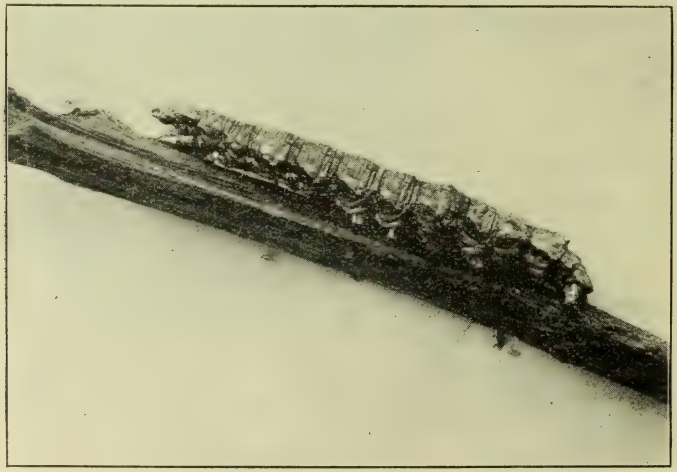

Fig. 9.—Larva of pecan Catocola.

tunately, I have never seen the very young larvae and hence cannot say anything of the length of life of this caterpillar. We give a brief technical

description of it as follows:—*The head is as broad as the first segment and is pinkish grey, striped with five delicate, reddish brown lines. The tubercles are not large but they are distinct and usually white, sometimes yellow. The dorsal stripe is irregular and constricted in the middle of each segment. It is light in color with an interrupted darker central line of minute dots. The young larvae are often darker than the mature ones. Length of mature larva two and three-eighth inches* (fig. 9).

Pupa.—This is the third stage in the life history of this insect. After the caterpillar has attained its growth, it wraps some leaves together and spins a thin silken cocoon inside. Sometimes only one

Fig. 10.—Parent moths of the pecan Catocala, male and female.

leaf is rolled up and a thin cocoon is spun inside of this. The caterpillar inside the cocoon then undergoes a remarkable change and becomes a quiet, dark, purplish object covered with a thin whitish powder. This is known as the *pupa*. In this stage the insect lies quiet, and eats nothing. The pupa remains in the cocoon just about one month and then comes forth as a full grown moth (fig. 10). One larva spun its co-

coon May 27, and came out as a moth June 23. Another spun its cocoon May 25 and came out as a moth June 26. Still a third and fourth spun cocoons May 28, and came out June 24.

Moth.—The adult insect is a rather large moth of sober but soft and velvety hues. The body is usually stout and about one inch long and is light gray in color. The wings have an expanse of two and three-quarter inches and in some specimens of three inches, or even a trifle more. The hind wings are dark brown above growing lighter towards the body, and edged with a narrow band of white. The front wings are gray above, with a dark stripe, describing an imperfect arc of a circle, across the front and outer corners (fig. 10). These wings are crossed transversely with light and dark wavy lines. When the wings are folded and the hind ones are covered by the fore wings the moth shows a remarkable resemblance to the bark of hickory and pecan trees. On the underside, the front wings are crossed by three, dark wide, wavy lines, while the hind wings are crossed by two only.

Distribution.—No doubt this insect occurs on the native wild pecans and probably on hickories which are closely related to the pecan. I had no difficulty in rearing the caterpillars on leaves of the wild pecan. Dr. Dyar, in his late list of the Lepidoptera, says it is distributed over the South Atlantic states.

Remedies.—Owing to the fact that the caterpillars devour the pecan leaves, they may be destroyed by the application to the leaves of some arsenical poison. Probably the commercial or the home made form of arsenate of lead, discussed under insecticides, will prove the best poison for this insect. Of course the poison would have to be applied early in May in this State, at least, because the caterpillars in ordinary seasons occur at about this time. It may be that in a forward spring they might appear earlier and in that case the time of spraying should be made to conform.

PECAN—LEAF CATERPILLARS.

(*Datana angusii G. and R.*)

(*Datana integerrima G. and R.*)

Perhaps the most serious enemies of bearing pecan trees are the two species of insects named above. They are better known than most of the other pests. Both of these caterpillars are very much alike in appearance and very likely both of them are taken for one and the same insect. Prof. H. A. Morgan reports the second one named as

occurring in abundance on pecans in Louisiana. The records of the division of Entomology show that the first one named, occurred in great abundance in the summer of 1897 in Mississippi City in this State. We have observed the caterpillars at work in Ocean Springs, Miss., and this season, for the first time, we have found them present in the College pecan orchard. From our observations we believe the species, *angusii*, to be most abundant in this State.

Habits and injuries of the pecan-leaf caterpillar.—The caterpillars are one and a half to one and three-quarter inches long, with enough soft, dirty-white hair on their bodies to be called hairy (fig. 11). Their bodies are dark colored and marked with two prominent white lines on each side of the body. The other longitudinal

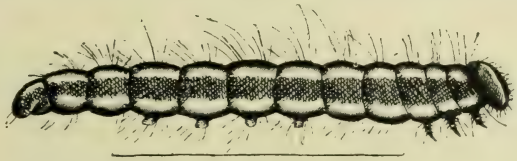

Fig 11.—A pecan-leaf caterpillar, *Datana integerrima*.

lines have become very faint. The caterpillars, in their growth to maturity, shed their skins several times and change in color during these molts. Just after the fourth and last molt the head and body are light red but soon turn dark. The caterpillars have the curious and interesting habit of leaving their feeding places in the branches and crawling down the trunk of the tree, where,in a close mass, they shed their skins for the last time. The masses of cast off skins may be seen clinging to the tree trunks late in the autumn.

When very young, the caterpillars eat on one side of the leaf only but as they grow and molt they begin devouring the whole leaf, except the large ribs, and later, these are also eaten thus completely destroying the leaf. Young pecan trees are often completely defoliated by this caterpillar. Mr. John Kelly of Mississippi City, in this State, wrote to the U. S. Division of Entomology in Washington, that the larvae of *Datana angusii* were very injurious to the pecan trees upon his own and neighboring plantations in the summer of 1897. He said that fully one-half of the trees in his own grove of 200 trees was entirely defoliated while the remaining trees were more or less affected. This same species was very abundant in the orchard of Mrs. W. M. Stuart and in other orchards in Ocean Springs in the summers of 1902 and

1903. It was also abundant on some of the young pecan trees in the College orchard.

The caterpillars, like those of the fall webworm, feed in colonies but do not spin large, conspicuous webs. As they near maturity they may be seen wandering singly over the tree but this is only for a very short time. After the larvae have crawled down the trunk and shed their skins for the last time, they crawl back up the tree and feed for a little while and then each caterpillar starts down the tree trunk to enter the ground to pupate. They go into the earth to a depth of four or five or even six inches, form a small earthen cell and there change to pupae.

Life history.—Like the pecan catocala and the fall webworm this insect has four stages in its life history,—egg, larva, pupa and adult.

Eggs.—The eggs are laid in batches of 400 to 800 or even more on the under side of the leaves. This habit is very similar to that of the fall webworm. The eggs of the pecan-leaf caterpillar are at first of a light green color but later become perfectly white. They hatch in five or six days.

Larvae.—We have already described the larvae and their habits. The caterpillars take about three weeks to complete their growth.

Pupae.—As already stated the pupae are formed in the ground and the summer broods remain there about two weeks, while the fall brood remains there all winter.

Adult.—The adult moth of *Datana integerrima* has a wing expanse of one and three-quarter inches. It is buff in color and the fore wings have four, brown, transverse stripes on them (fig. 12).

Fig. 12.—Parent moth of the pecan-leaf caterpillar.

Natural enemies.—Prof. Morgan found that *Datana integerrima* was the victim of several different parasites.

One of the parasites is a fly (*Tachinoides hystricoides*) quite similar to the one we have spoken of as parasitic on the webworms. This fly is a little larger than a house fly and lays its eggs on the back of the

caterpillars where they hatch and the maggots live within the bodies of their hosts eventually killing them.

A second and larger fly is also parasitic on these caterpillars and, no doubt, is quite effectual in checking their increase.

There is also a small insect that is parasitic on the eggs of the moth. Prof. Morgan says that out of one batch of twelve hundred eggs every one was parasitized.

Finally a word must be said in regard to the role played by birds in destroying this pest. The yellow billed cuckoo or the rain crow has been observed to "habitually visit pecan trees for the purpose of feeding upon the caterpillars." In fact, Prof. Morgan says, that out of a lot of one hundred caterpillars placed upon a young pecan tree every one was destroyed by this bird.

The indiscriminate shooting of birds for a pastime should be strongly condemned. With very rare exceptions birds should be protected and fostered. The more birds there are about the plantation, the freer will be the crops from insect pests.

Remedies.—We have already described the manner and place in which the eggs are deposited. Whenever these are found they should be destroyed unless we are sure they are parasitized. If they are infested with parasites, they should be left alone in order that the parasites may develop.

The caterpillar may be destroyed in considerable numbers, if watched rather closely, when they descend the trunk to cast their skins. Of course, they will by this time have done most of their feeding, but nevertheless it is important that they be destroyed in order to prevent a larger future brood.

Finally, there remains the application of some arsenical poison. The methods of making these poisons and applying them will be discussed under the head of spraying and spraying materials.

THE LIVE-OAK ROOT-BORER.

(*Mallodon melanopus Linn.*)

During the summer of 1903 we were surprised by receiving a specimen of the above bettle from one of our correspondents who said that it, in company with other individuals of the same species, had eaten off a pecan tree at the base of the trunk. He says, "I am sending you a large bug that I found eating the inside of the bottom of the

trunk of a young pecan treee. The tree is five years old, seemed very healthy and did not discover anything the trouble with it until it blew down.

On examining it I found the trunk eaten all away just below the ground, causing decay where it was eaten, although the main trunk seemed healthy. There was a mate to the one I send and one just hatching out and very nearly as large as this one."

This is the first time, so far as I am aware, that this insect has been recorded as occuring on the pecan. Of course the injury to the tree was caused by the larvae of the beetle boring through the wood to obtain food. The larvae are very common, as borers, in certain parts of the south, especially in Georgia and Florida, on the roots of the

Fig. 13.—Parent beetle of the live-oak root-borer.

live oak. Dr. Riley, in his report for 1884, discusses the habits and injuries of the Mallodon borers at some length. In their work upon the live-oak the adult female beetles select saplings on which to lay their eggs. The eggs are deposited in the foot or collar, of the tree just below the surface of the ground. "The effect on the tree is to kill the original sapling, which becomes replaced by a cluster of insignificant and

straggling suckers, forming perhaps a small clump of underbrush." Dr. Riley further states that the "Mallodon borers are very abundant in south Georgia and Florida, and as a result of their attacks, vast tracts which might otherwise have become forests, enriching the ground with annual deposits of leaves, are reduced to comparatively barren scrubs, in which the scattered oak bushes barely suffice to cover the surface of the sand."

This insect is one of our largest beetles and is from one and three-fourths to two and a quarter inches in length and five-eighths of an inch broad. It is dark brown in color with long feelers, or antennae. Figure 13 shows this beetle natural size. The larva or borer that hatches from the egg laid by the parent beetle finally becomes as thick as one's fore finger and nearly three and one-half inches long. In figure 14 is given a view of this remarkable borer from above and from the side. It is supposed that the borer lives several years before attaining its growth. Since the pecan tree attacked was only five years old, the borer could hardly have been more than two or three years in attaining its growth.

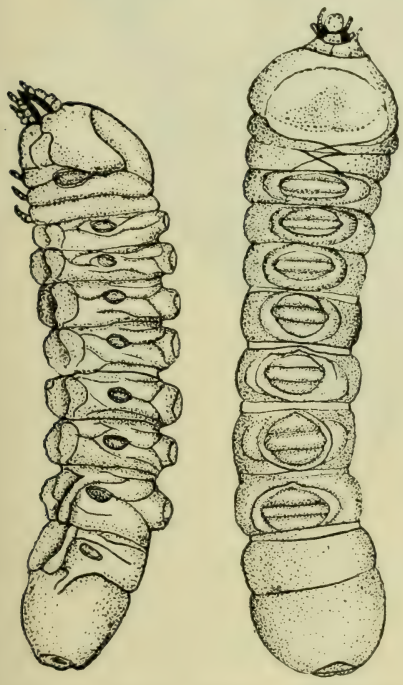

Fig. 14.—Live-oak root-borer, showing side view at left and top view at right (After Riley).

The only thing I am able to suggest as a preventive measure against this insect is to examine the young pecan trees frequently at their bases for the borers and if they are present to dig them out. It may often be possible to run wires into the burrows of the larvae and kill them in that way.

THE FALL WEBWORM.

(*Hyphantria cunea Dru.*)

Another insect that becomes, at times, a very serious pest to pecan trees by eating the foliage is the fall webworm, so called. This is the insect that builds so many large and unsightly webs on many of our

forest trees, notably persimmon, hickory, wild cherry, ash and others. In fact, Dr. Howard says that the records of the Division of Entomology show that it feeds upon 120 different species of forest trees, ornamental trees and fruit trees. The fall webworm is widely distributed, being

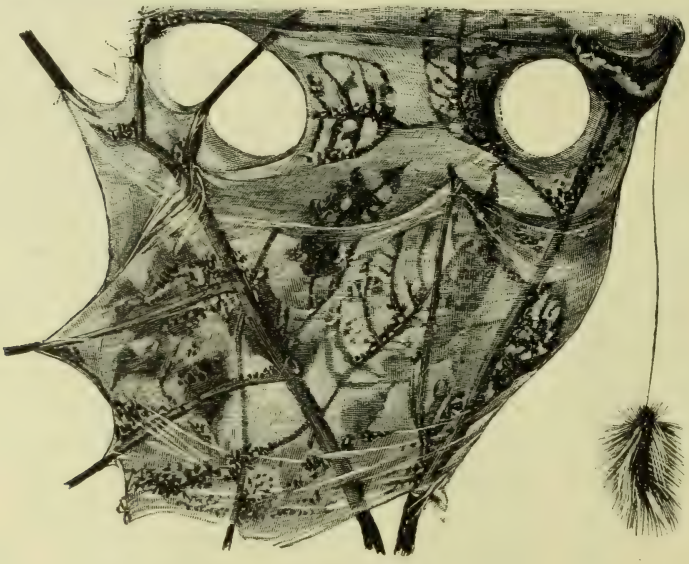

Fig. 15.—Web of the fall webworm (from Farmer's bulletin No. 99, Dept. Agri., Bureau Entomology).

found all over the eastern and central parts of the United States and as far west as Texas and Montana.

Name and number of broods.—In the north this insect has but one brood in a year, the caterpillars of which become injurious in the latter part of August and in September. Hence it was given the name of *fall webworm*. South of New York however, it is double brooded,—one brood appearing in the spring and another in the autumn. In the spring brood which we obtained from pecan trees, the adult moths appeared from July 8 to July 12. We obtained the fall brood on persimmons in the latter part of September but the caterpillars were not full grown at this time. The records of these two broods show that the caterpillars are in existence and doing their damage in the latter part of May and in June and in the latter part of August and in September. The greatest damage is probably done by the fall brood in August and September.

Life history of the fall webworm.—Like the pecan catocala,

this insect has four distinct stages in its life history,—egg, larva, pupa and adult. Moreover, as we have just pointed out, the webworm has two distinct broods, or generations in a season.

Eggs.—The eggs are laid by the parent, in batches of four or five hundred on the underside of the leaves of the food plant. The eggs are globular and small and of a pale, delicate green color. They hatch in about ten days.

Larvae, or caterpillars.—The caterpillars that hatch from the eggs are very small at first but immediately begin to eat the leaves. They eat the upper and under skins of the leaves, causing them to turn brown and crisp. As the caterpillars begin to eat they begin

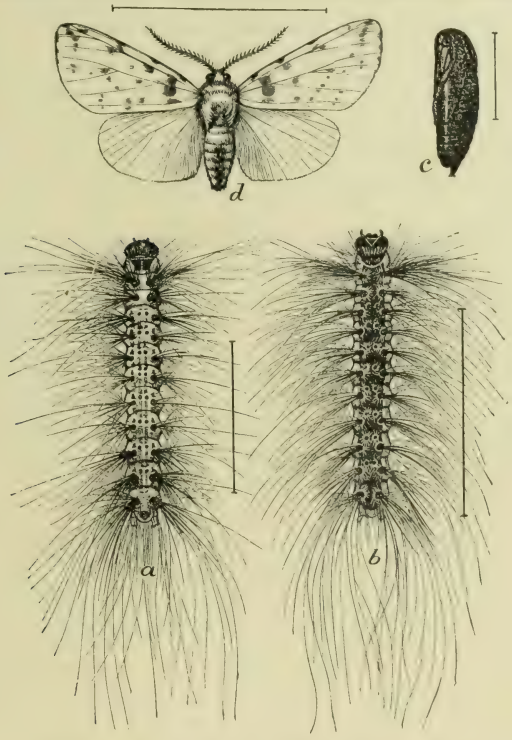

Fig. 16.—Fall webworm. a, and b, caterpillars of same; c, pupa; d, moth (from Farmer's bulletin No 99, Dept. Agri., Bureau Entomology).

to spin a web and to tie the leaves together with it. They live inside the web eating the leaves which they have tied together and as they grow they enclose more leaves within the web until the web often covers a whole branch (fig. 15). When all the leaves within one web are de-

voured, the larvae leave it for a new branch, perhaps, and build another web. Thus the tree may become fairly covered with the webs of this insect. As the caterpillars grow they shed their skins and these are left within the bunch of sear brown leaves, making altogether an unsightly mass.

When fully grown the larvae are about one inch long and very hairy. The body is covered with both short and long hairs; some of the latter are an inch or more in length (fig. 16). About this time they begin to leave the webs and climb down the trunks for suitable crevices in which to lodge and spin their cocoons.

Pupae.—The cocoons, that the caterpillars spin, are very light and thin in texture, and are composed partly of the hairs of the larvae. The cocoons may be found in cracks and crevices of the bark of the trunk, at the base of the trees, or in rubbish that may be nearby. Within the cocoons may be found the hard, brown, and quiescent pupae. The pupae of the spring brood remain in the cocoons for a few days and then come forth as adults. The pupae of the fall brood remain in their cocoons until the following spring.

Adults.—The adult insect is a beautiful, delicate moth with wings expanding an inch or an inch and an eighth. The moths of any one brood are quite apt to vary somewhat in color. It is probably safe to say that the majority of the moths of any one brood will be pure white. Often, however, there will be some that will be white but spotted with black or brown. It would seem from observations by Mr. Henry Lyman, that the spring moths vary much more in their coloring than the autumn moths, the latter showing a greater tendency toward a pure white color.

Natural enemies.—It is a common and rather trite saying, now-a-days, that the forces of nature are held in balance, as it were. For example, in some seasons the cotton worm appears in such great numbers over certain areas that it has been termed the army-worm. The following season, perhaps, these worms are scarcely noticed so few are they in number. Evidently, for some reason, the force that held them in check the preceding season had suddenly become weakened; but as the season, following the one of unnatural increase rolled around, the force regained its normal strength and again reduced the worms to their usual number. The same thing may be said of the fall webworm. Two years ago, 1901, they were very abundant everywhere in the State. During the seasons of 1902 and 1903 they have not been so abundant. Doubtless the fluctuation in the numbers of

the webworm in different seasons is due to several causes; but, perhaps, chief among the forces that control the "out-put" of webworms in a single season is that of the parasitic and predaceous insects that prey upon them. There are several insects that live upon and destroy the webworms and it is evident that when these foes are most abundant the webworms are apt to be least abundant and *vice versa*. Consequently it becomes a matter of considerable importance to foster, if possible, the increase of the enemies of the webworm. Therefore, a brief description of them is given that pecan growers may become sufficiently familiar with some of them, at least, to allow them to increase naturally and not to destroy them, thinking they are injurious insects.

Mantis.—Among the best friends of the fruit growers and genera agriculturist in this State are the insects variously known as the "devil horses", "mule-killers", and "praying mantes." These insects are very voracious subsisting upon other insects and are among the best insect destroyers we have and should be protected and fostered at every opportunity. The eggs are laid in large white masses usually stuck to branches of trees. These egg masses are familiar to most of us and they should never be destroyed. The "devil horses" live upon the caterpillars of the webworm and destroy numbers of them.

Wheel-bug—This is another common insect that preys upon the web-worm caterpillars. The wheel-bug is so called because of the toothed prominence on its back that resembles half a cog-wheel. The larvae, which are bright red, and the adults are all carnivorous and destroy even more of the webworms than the devil-horses.

Stink-bugs.—These bugs are familiar to most of us because of their unpleasant odor. This is especially noticeable, sometimes, upon berries, for these bugs leave a strong trail wherever they travel much to our disgust. One of these, known as *Podisus spinosus*, preys upon the webworm and should be carefully protected.

An Egg parasite.—Although the eggs of the webworm moth are very small, there are some insects small enough to live within the eggs and devour the contents thus destroying them. In some cases whole batches of eggs have been found parasitized by this tiny insect and of course did not produce any caterpillars. The name of this small but efficient parasite is *Telenomus bifidus*.

Parasites on the caterpillars.—There are also a few small insects that are parasitic on the caterpillars. These insects deposit their eggs on the caterpillars and the larvae live within the cater-

pillars eventually killing them. There are two* of these small parasites that belong to the wasp and bee family that are of very great aid in holding the webworms in check. It is quite probable that if it were not for these tiny enemies the webworm would become an almost uncontrollable pest. Whenever dead webworms are found with the small white cocoons attached to them, we may conclude that they were killed by one of the parasites just mentioned and the little cocoons should never be destroyed for they contain within them the undeveloped enemy of the webworm. One of the parasites above mentioned usually suspends its tiny cocoon by a slender thread from a branch or leaf. Finally there is a fly, greatly resembling a large house-fly that glues its eggs to the back of the caterpillars. Here they hatch and the maggots living within the bodies of the caterpillars finally kill them.

Remedies.—Owing to the fact that the caterpillars feed in groups, they may be easily reached and destroyed with considerable efficiency. Perhaps the most effective remedy for this insect in small pecan orchards or where a small number of trees is concerned is to destroy the caterpillars by burning them when they have collected together within their webs. This may be done by any efficient form of torch fastened to the end of a long pole. A bundle of rags or a porous brick saturated with kerosene oil and wired to a pole is as good as any. Care should be taken not to burn more of the foliage than is necessary. During the fall and winter months the cocoons of the webworm may be collected in quantities and destroyed. Finally, there are the arsenical poisons. Probably Paris green is the most universally used but arsenate of lead is more desirable for some reasons. These, together with the methods of application, will be treated under the head of spraying and spraying materials.

THE WHITE ANT.

(*Termes flavipes Koll.*)

We found in our inspection of certain nurseries in this State that very many seedling pecans, six months to one year old, were killed by some insect boring into the stem just below the surface of the ground and eating down into the tap root. The insect seemed to gain an entrance by boring a tiny hole into the stem just below the surface of of the ground. From this point of entrance the pest worked downward eating all of the woody portions leaving only a hollow cylinder

*Apanteles hyphantriae. Meteorus hyphantriae.

of bark. Of course the seedlings quickly succumbed to such an attack. Upon investigation we found that these injuries were due to the common insects variously known as "white ants," wood-lice," and Termites(fig. 17).

Nature and injuries of the insect.—Although called the "white ant" this insect is not an ant. In fact it is far removed in its kinship, from the true ants but does superficially resemble ants in

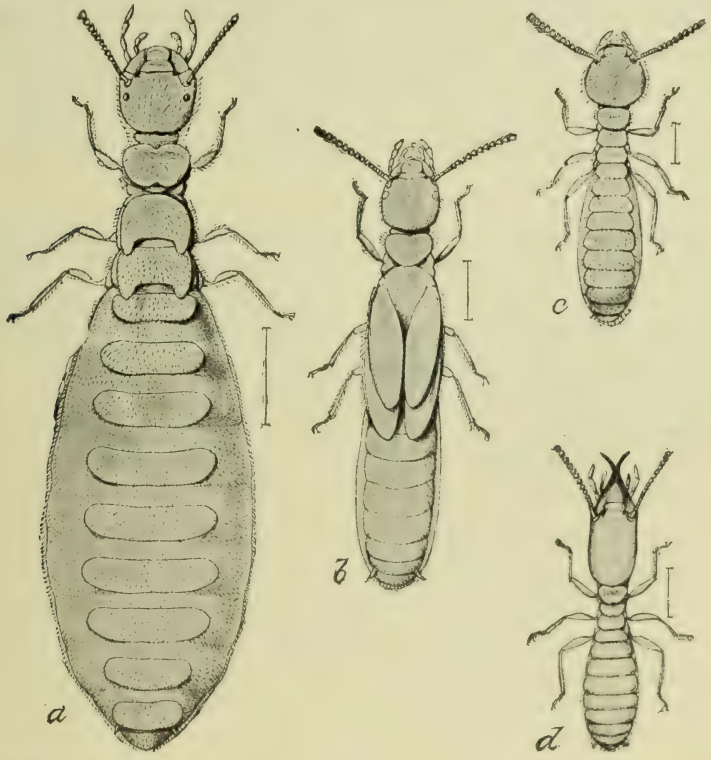

Fig. 17.—White Ant; a, queen; b, nymph of female; c, worker: d, soldier—all enlarged (from circular No. 50, U. S. Dept. Agri., Bureau Entomology).

form of body,and particularly in the fact that it lives a social life,—in colonies,—like the true ants. As its name implies, the "white ant" has a milky-white body and lives beneath stones, old logs, under the foundations of buildings, &c. It always avoids light by remaining hidden in its burrows, therefore,it is not often detected until it has done its injury. There are several instances on record in which the insect

has done serious damage to the foundations of buildings. The white ant has also been known to destroy books and papers stored in unused vaults. In fact, a school library in South Carolina that had been left closed for the summer was found on being opened in the autumn to be completely eaten out and rendered valueless. Other instances are on record where books and papers have been destroyed by the attacks of this pest.

In our observation of the work of the white ant on pecans, we found it confined entirely to the seedling trees of the first year's growth. The nursery in which we found them most abundant and most injurious was situated on a high, dry, and sandy knoll which had been heavily dressed with horse stable manure so that the soil must have been full of humus. The land was also new having been recently cleared. In this nursery as high a proportion as one third of the seedlings was killed in one season.

Unfortunately,the attacks of the white ant on pecans are not cconfined to seedlings in the nursery row. Mr. Marlatt, of the U. S. Department of Agriculture, records an instance in Augusta, Ga., where these insects "entered the roots and ate the hearts from the tree, rendering the limbs and branches nothing but hollow shocks." In this same locality they attacked the rose, English walnut, and chestnut much worse than the pecan. It is worthy of note that the soil on which these plants were growing was comparatively new having been cleared only one or two years before the nuts were planted.

Mr. H. E. Weed, formerly of this Station, says that in 1891 he received notice that some young pecan trees near the college were being seriously injured by borers. "The trees were from nuts planted in the spring and were from twelve to fifteen inches high and from one-third to one-half inch in diameter. An examination showed the injury to be from the work of a small white ant, (*Termes flavipes*), and not to a larva as had been supposed. The ants attacked the trees just below the surface of the ground and after making an opening through the bark, they had,in many cases,eaten out the entire woody part of the stem for a distance of two inches, leaving the young trees supported only by the outer ring of bark and the damage was not apparent until the trees had been killed." This is exactly the kind of injury we have already noticed as taking place in the nursery row.

Life and habits of these insects.—Like the true ant the Termites are social and live in colonies. A colony of Termites is com-

posed of several different kinds of individuals. There are the workers, perhaps the most abundant individuals to be found in a colony at most seasons of the year; the soldiers, which differ from the workers in being much larger and in having very large and powerful jaws; the winged males and females at certain seasons of the year; and finally, the king and queen. It is the duty of the workers to build the nests, obtain food, care for the young ones, attend to the wants of the king and queen and, in general, to perform all the arduous duties of the colony. The soldiers do the fighting and are especially fitted for this purpose, being provided with enormous heads and strong jaws. The winged males and females swarm out from the colony at the proper season, usually in spring, in great clouds and it is these that are perhaps better known than any of the others. The queen, when present, develops to an extraordinary size for such small insects becoming six or seven inches long and greatly resembles an Irish potato. She lays the eggs for the colony.

The workers and soldiers are blind and all the Termites are miners always avoiding the light. If the members of the colony wish to go some distance from their nest they build a covered way, out of pieces of decayed wood, leaves, &c., to the place which they wish to reach. In the tropics these insects are especially injurious to household furniture. One living in the tropics need not be greatly surprised if the desk on which he is writing suddenly collapses and falls to the floor. It occasionally happens that when a desk has been left standing in one place for a considerable length of time, the Termites enter it from below through hidden tunnels and actually eat out the inside of the supports leaving only their shells which are incapable of supporting any weight and consequently the desk collapses.

Remedies and preventives.—The habits of the insect make it exceedingly hard to combat. Often the damage is done before it is known that any danger is imminent. Again, because of the fact that it lives in colonies it does no particular good to destroy a few isolated members here and there. The whole colony must be reached and the nest destroyed to obtain any permanent results. This may be done, in some cases, by pouring boiling water on the nest or by injecting carbon bisulphide into the nest and then packing the soil tightly on top to retain the gas. The carbon bisulphide may be introduced into into the nest by pouring it into holes made with a round, pointed stick. The holes should be carefully stopped afterward.

As we have said before, we have noted this insect most injurious in newly cleared ground and in soil containing much humus. It is

natural that it should be most prevalent in new soil, since it lives in old stumps, decaying pieces of logs, limbs, &c. If new ground is used for pecans, particular attention should be paid to removing all the stumps and pieces of wood. In fact it would be much safer to grow two or three cereal crops on the ground before setting it in pecans.

In the nursery in which we found the Termites most prevalent the use of horse-stable manure has been abandoned because this fertilizer did not give the results anticipated. Better results have been obtained in growth of trees with commercial fertilizers. This change from stable manure to commercial fertilizers will, no doubt, also produce an appreciable effect upon the diminution of this insect, although it is too early to predict with certainty as this is the first year that commercial fertilizers have been used and the stable manure is yet abundant in the soil. At any rate, I should recommend the use of commercial fertilizers for pecans in the nursery row so far as Termites are concerned.

THE OAK PRUNER.

(*Elaphidion villosum Fab.*)

Although this insect is known as the oak pruner, it attacks many other trees besides the oak and in the summer of 1900 I bred the

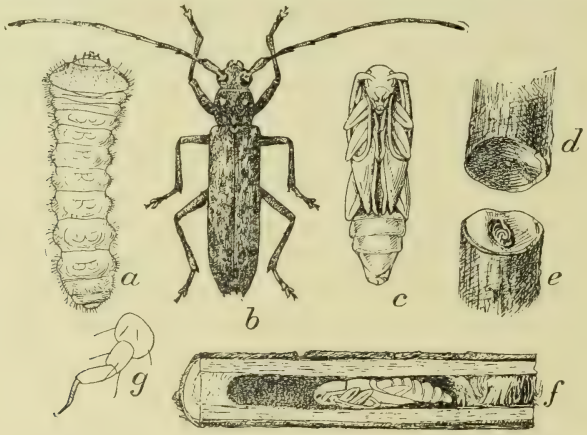

Fig. 18.—The Oak Pruner; b, beetle; a, larva; c, pupa; d, end of twig cut from tree by larva; f, twig slit open to show pupa within (from Bull. No. 18, U. S. Dept. Agri., Bureau Entomology).

adult beetle from pecan branches, thus adding another food plant to the already large list of plants that are infested by this beetle.

Where the oak pruner is abundant it is a common thing to find

the ground beneath oak trees littered with small branches and twigs that have been cut from the trees by this pruning beetle. It is said that the insect occasionally cuts off branches several feet long; but usually they are from a few inches to one or two feet in length. Within nearly every cut-off branch will be found a soft, white grub living in a burrow that it has made for itself in the hard wood of the branch. This is the larva of the oak pruner.

Life history.—The adult female beetle deposits an egg in a branch of the tree which soon hatches into a small white larva. The larva immediately begins eating the wood just beneath the bark usually traveling toward the base of the limb. Later, it works into the middle of the branch and keeps on eating out its burrow which sometimes reaches several inches in length. Finally, the larva cuts the wood of the branch all the way around so that it falls of its own weight or is broken off by the wind. The larva transforms to a pupa in the burrow in the fallen limb. It takes about three years for this insect to complete its growth (fig. 18).

The larva does not always cut the branches off in which it lives.

Food plants.—This beetle has been found to infest a wide variety of plants. Among the list of known species are, the oak, Abies, hickory, chestnut, maple, apple, plum, peach, grape quince, locust, redbud, wistaria, sumach, orange, osage orange and pecan. Mr. Marlatt says that probably it attacks other plants than these named.

Remedies.—Whenever it becomes abundant it may be controlled by picking up and burning the fallen branches, as was recommended for the pecan pruner. In fact the two insects may be destroyed by the same process and at the same time.

THE HICKORY AND PECAN WEEVIL.

(*Balaninus caryae Horn.*)

In some seasons,—particularly this season,—when the wild pecan nuts are gathered in the autumn, many of them will be found with a small round hole bored through the side of the shell. The kernels of such nuts are always partly, and very often, wholly destroyed. If any of the kernel remains, it is blackened and shriveled and unfit to eat. The cultivated nut is also subject to the same trouble (fig. 1). These holes are made and the kernels of the nuts are eaten, by the grub of a small beetle known as the hickory weevil because it is better known from its work on the hickory nut, but, since the same weevil

infests pecan nuts, it may be appropriately called the pecan weevil also.

Comparatively little has been written regarding this insect and unfortunately all the grubs received by me have arrived in such a dried and shriveled condition that they did not mature. Therefore, it cannot be said positively, at this time, that it is *B. caryae* which infests pecans in this State; but since this species is known to infest both the hickory and the pecan nut, we are probably safe in considering the grub found so often in pecan nuts in the South as *B. caryae* (fig. 19).

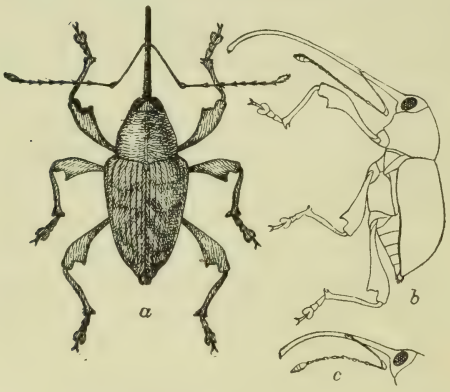

Fig. 19.—Hickory-nut weevil; a, female; b, same, lateral view, in outline; c, head with beak and antenna of male, about two and one-half times natural size (from Bull. No. 44, Dept. of Agri., Bureau Entomology).

Extent of injuries by this weevil.—It is difficult to give an estimate of the damage done by this insect. It is much more prevalent in some localities than in others and is much more abundant some years than others. In 1902 Mr. Herbert Post, manager of the Texas Seed Pecan Company, Texas, writes that the "grubs" were very abundant that season. He says, "I do not remember any previous year when these 'worms' have been so plenty as this. Some trees which heretofore had annual crops failed this season by the great abundance of worms." The Rev. Wm. Short of St. Louis, Mo., who has a pecan orchard in this State, says the grubs are an important pest among his pecans. He finds a considerable proportion of the nuts totally destroyed by the larvae of this beetle. Without doubt, this insect causes more loss to pecan growers than they are aware of, and with the increase of area devoted to pecan trees there will probably be an increase in the damage inflicted by the pecan weevil.

Appearance and habits of the weevil.—The insect, causing wormy pecans is a small beetle,a little less than one-half inch in length. The ground color of its body is dark brown, nearly black, and its body is covered with minute hair-like scales. The female is notable for its slender snout, or proboscis projecting from her head which is as long as the body (fig. 19). At the tip end of the snout is a sharp pair of

mandibles, with which the female bores a minute hole through the husk and tender shell of the young pecan nut. At the bottom of the hole, which reaches to the tender kernel of the nut, an egg is deposited where the young grub may have suitable food. The grub is about three-eighths of an inch long, yellowish in color and with a bright red head. It is usually in a half curled position and is wrinkled transversely. The larvae, or grubs leave the pecans in the autumn by boring holes in the shells (fig. I) through which they issue and enter the ground to pass the winter.

We received many nuts, from Mr. Herbert Post of Texas in December, 1902, which were infested with the larvae, but were unable to rear the adults. Most of the grubs had left the nuts when they reached me and were shriveled and inactive. Often the grubs do not leave the nuts until after they are gathered and stored.

The adults issue from the ground during the spring or early summer and probably soon thereafter deposit their eggs.

Methods of control.—It will probably never be feasible to destroy these weevils with poisons applied to the leaves of the trees because the adult insects feed very little, if any, upon the leaves.

The grubs inside infested nuts may be killed by heating the nuts to a temperature of 125° to 150° F. It often happens that the grubs are small when the nuts are first gathered, especially if they are gathered early. At this time not much damage has been done and if the grubs are killed right away with heat they will do no further damage.

The most universal method of combatting these weevils, is to gather the nuts and store them in tight boxes from which the grubs cannot escape. The grubs will leave the nuts when they may be killed by fumigating with carbon bisulphide—one pound to 1,000 cubic feet of space. To make this treatment effective, great care should be taken to gather every nut on the trees and ground. This work must be done thoroughly and all the remnants must be gathered. In many cases it would be of very great advantage to allow hogs to run in the pecan orchards to eat the nuts that might have been overlooked. If this is done and the gathered nuts are all stored in tight boxes and then fumigated with carbon bisulphide the brood of beetles for the next year would be very greatly reduced. If the nuts are allowed to remain in the boxes long enough the grubs will die without fumigating for they must reach the soil in order to transform into adults. It is well to remember that the gas from carbon bisulphide is very inflammable and

will explode when brought in contact with fire. Therefore, the boxes should be aired thoroughly for 48 hours after being fumigated before a light is brought near them.

THE PECAN BUD-WORM.

(*Acrobasis sp.*)

One of the most serious pests to the buds of pecans is what is known as the bud-worm. I have never been able to rear the adult of this pest owing to the lack of material and cannot say positively what species it is. The larva, however, is very destructive to newly set spring buds and sometimes to the buds of trees the first year after transplanting. Dr. F. H. Chittenden reports injury to pecan buds in Georgia, during 1902, by three species of *Acrobasis; rubrifasciella* Pack., *angusella* Grt., and *palliolella* Rag. The following notes on the habits of the bud-worm were made by Mr. James Brodie of Biloxi, Miss. He says, "I found it a very destructive pest among spring buds when I practiced that system of propagating pecans. In spring budding, the buds are placed and forced out the same season, but are generally late in starting—say the end of April or beginning of May. The moth deposits her eggs just as the bud opens. At birth, the larva is small, not more than one-eighth of an inch in length. It secretes itself in the inner folds of the opening bud and begins work. Its presence is apt to be overlooked until damage is done. As the larva advances in growth it spins a web around the small, expanding leaves, with the evident object of retarding growth of the bud and affording cover while in the pupa stage. When the mischief has been done its presence is easily detected by the blighted appearance of the bud and an accumulation of excreta that entangles in the web.

The most effective remedy I found was close daily inspection and the removal of the worm on a pin point.

This same moth frequently attacks the buds of trees the first year after transplanting. Like the spring buds, they are apt to open late and if weakly they are liable to be damaged and the planter discouraged. With sound, healthy trees or established summer buds, the case is different. The growth of such buds is well advanced or made before the moth appears and consequently beyond the stage liable to serious injury."

Prof. Sanderson says that *Acrobasis caryae* is a frequent pest of young pecans. He says, "the larvae bore into the young pecans,

hollowing them out and causing them to drop to the ground. Later they riddle the husk and channel the surface of the nut. This species occurs on pecans where they grow in Texas, and, according to Dr. Dyar, in Illinois, Massachusetts, and New York. It is reported to sometimes almost totally destroy the crop in localities and to do serious injury generally in West Central Texas, the chief pecan section."

SPRAYING, MATERIALS, MIXTURES, APPARATUS, ETC.

The time is not far distant when, to grow pecans successfully in paying quantities, it will be necessary to spray intelligently and thoroughly. The discussion of the subject of spraying will necessarily be brief and will deal with its relations to pecan trees only.

Materials.—Some form of arsenical poison is the best material to use in combatting the caterpillars that devour the leaves of pecan trees. Arsenical poisons are sold now-a-days under several different names. Perhaps Paris green is the most familiar form. Others are "London purple," "Swift's Arsenate of Lead," "Disparene," "Pink Arsenoid," &c. Probably Paris green is the most universally used but arsenate of lead has distinct advantages, in some ways, and is coming to be used more and more.

Paris green.—This poison in its pure form consists of 58.65 per cent of arsenious oxide, 31.29 per cent of copper oxide, and 10.06 per cent of acetic acid. The commercial form of Paris green is very often adulterated and therefore difficult to procure in a condition safe and effective for use. It should not contain over 4 per cent free or water soluble arsenic. Unadulterated Paris green may be applied to pecan trees at the rate of 1 pound to 150 gallons of water. It is always best to add the poison to one or two pounds of slaking or freshly slaked lime. The lime takes up whatever free arsenic is present and prevents the burning of the foliage.

Paris green is in a crystal form and these crystals, especially if coarse, easily sink to the bottom of the spraying tank. To obviate this difficulty the pump should be provided with an agitator in order that the liquid may be kept in constant motion and the poison in suspension.

Arsenate of lead.—This substance is a chemical combination of arsenic and lead. Moreover there is no free arsenic for it is all combined with the lead. Therefore there is no danger of burning the foliage with this insecticide. This is its great advantage over Paris green.

Moreover, it is more easily held in suspension in water than Paris green. Finally, arsenate of lead clings to the leaves much longer and much more tenaciously than Paris green and,although its initial cost is greater than Paris green, yet we believe that in the long run, when the quality of the latter is taken into account, arsenate of lead will prove the cheaper and better insecticide.

It may be made as follows: dissolve in 1 gallon of hot water, in a wooden bucket, 11 ounces of acetate of lead; in a second wooden bucket with one half gallon of hot water, dissolve 4 ounces arsenate of soda; pour the arsenate solution into the solution of lead and then pour both into 50 gallons of water. The two solutions will form a milky mixture that is ready for use at once. Cold water may be used in dissolving the compounds but hot water does it more quickly and more thoroughly. The mixture may be several times stronger than detailed above without danger of injury to the foliage.

Care should be exercised to obtain the best grades of both chemicals.

Commercial forms of arsenate of lead are sold under the names of "Disparene" and "Swift's Arsenate of Lead." The former is manufactured and sold by the Bowker Chemical Co., 43 Chatham Street, Boston, Mass. The latter is manufactured and sold by Wm. H. Swift & Co., Boston, Mass. These are splendid compounds and have given good results in our work with the Colorado potato beetle. They are more expensive than the home-made arsenate of lead and are no better.

Lime compounds of arsenic.—There are several methods of making these compounds and they are commendable because of their cheapness and effectiveness. Arsenite of lime is simply a combination of white arsenic and lime.

Taft's formula for making arsenite of lime is as follows: boil one pound of arsenic and two pounds of lime in two gallons of water for forty minutes. Dilute this mixture by adding 300 gallons of water and then apply with a sprayer. If the mixture is carefully made and boiled continously for full forty minutes an insoluble compound will be formed; but,as a precaution, it is best to add one pound of lime to every pound of arsenic when diluting it to 300 gallons.

Prof. Kedzie also recommends a mixture of sal soda, lime and arsenic made as follows: boil one pound of white arsenic with four pounds of sal soda in one gallon of soft water for fifteen minutes, or until the arsenic dissolves, leaving only a small muddy sediment. This

will form a stock solution of arsenite of soda which may be kept in a stoppered jar or jug until needed during the spraying season. When ready to use, slack two pounds of lime, dilute it with two gallons of water and add one pint of the arsenite of soda solution. Finally, dilute this to 40 gallons of water and it is ready for spraying. "The arsenic in this mixture is equivalent to four ounces of Paris green." This mixture of lime, soda, and arsenic is much cheaper than Paris green, and it will remain in suspension much longer and is equally effective.

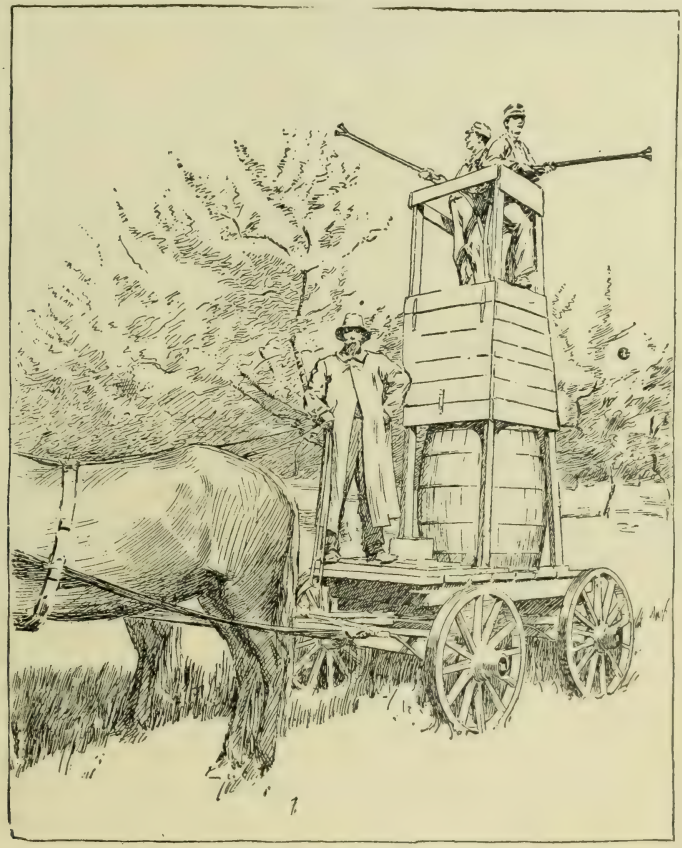

Fig. 20.—Barrel sprayer with platform (from Bull. 101, Cornell Univ. Expt. Sta).

London purple.—This is a by-product in the manufacture of aniline dyes and contains about 50 per cent of arsenious oxide. Unfortunately, London purple varies greatly in its composition and is very apt to contain free or soluble arsenic which burns the foliage. It is,

however superior to Paris green because it is much more finely divided and remains in suspension much better. It should always be added to twice its weight of freshly slaked lime and applied in the same proportions as Paris green.

Spraying outfits.—To spray pecan trees successfully, a force pump capable of developing considerable power and fitted with one or two lines of hose, 20 or 30 feet in length, is needed. One should have nozzles that will throw a fine or coarse spray according to adjustment. If one could manage to reach all parts of a pecan tree, probably some form of a vermorel nozzle would be preferable. It often happens, how-

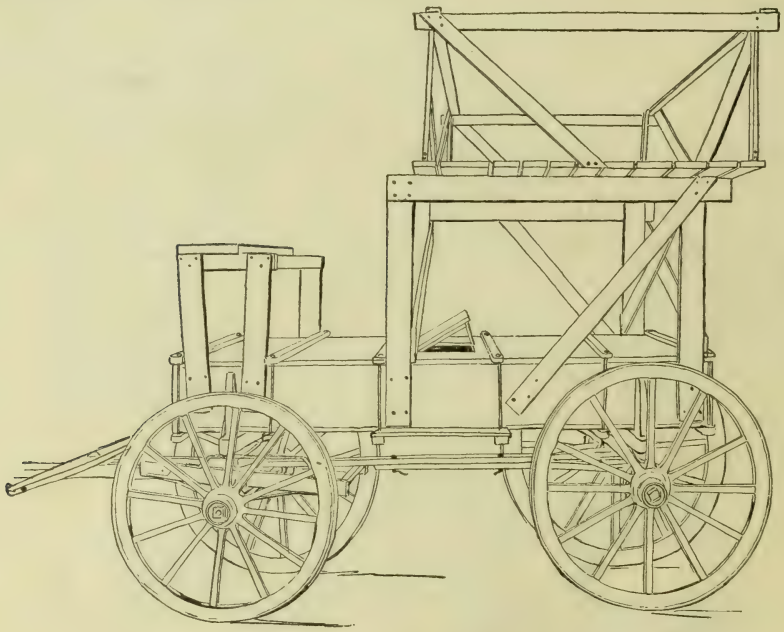

Fig. 21.—Tank sprayer (from Bull. 101, Cornell Univ. Expt. Stat).

ever, that a distant branch must be reached by using a stream and in this case another form of nozzle would be better. Probably the "McGowan," or the "Bordeaux," or the "Seneca," nozzles are as good for this work as any. When trees of considerable height are to be sprayed, extension rods will be found necessary. These are rods or poles ten or twelve feet long, to one end of which, the nozzle is securely fastened. By this means, the nozzles may be pushed into the center of the trees or extended to much higher points than could be done otherwise.

It is impossible to spray the larger pecan trees with the pump

Mississippi Agricultural Experiment Station.

BULLETIN No. 87. JANUARY, 1905.

REPORT OF WORK AT McNEILL BRANCH EXPERIMENT STATION FOR 1904.

E. B. FERRIS.

Introduction.—During the year just closed work has been continued at McNeill along practically the same lines as heretofore published in the station's two annual reports. The results of the year's work, as a whole, show up well for this section of the state, for besides the regular scientific investigations that have been carried on, the station has grown a number of crops in sufficient quantities to demonstrate, in a practical way, the business side of the question.

Seasons.—The seasons were more favorable this year for fruits and vegetables and less favorable for cotton and corn than they were the year before. It is to be regretted that we cannot give a summary showing exact weather conditions, but our records for July, together with the weather instruments, were destroyed by fire during the latter part of July and the keeping of these weather records was not resumed during the year further than to begin keeping a record of rainfall after the first of September.

We secured the records kept at Poplarville, 15 miles away, and in the data given have substituted their rainfall for July and August. As the precipitation was the main feature of the weather which influenced yields we give this for the several months: January, 4.04; February, 4.96; March, 2.71; April, 1.60; May, 2.50; June, 4.67; July, 7.54; August, 7.55; September, 5.16; October, 1.72; November, 1.72; December, 4.16.

The months of April and May and the earlier part of June were too dry for the best growth of crops, while July, August, and September were entirely too wet.

Our seasons, so far as rainfall was concerned, seemed not to have differed greatly from those of other portions of the state except that elsewhere the weather was dry after September 1st and favorable to

the fruiting of cotton, while here the rain continued through September and almost entirely prevented the setting of forms on cotton.

FRUITS AND VEGETABLES.

The growing of fruits and vegetables, along lines of railroads in this section furnishing outlets to Northern markets, bids fair to reach enormous proportions. The soils here are naturally suited for the production of early crops of many kinds, being sandy loams that dry out and warm up very early in the spring, while they have a subsoil sufficiently close to admit of a high degree of fertilization. Last spring our crops were matured considerably ahead of most other portions of the state, the Gulf Coast, of course, excepted. While the seasons, so far, have been somewhat unfavorable for vegetables on account of drought in the spring, it must be remembered that the soils on which we are operating have been cleared since the summer of 1902 and therefore the effects of the seasons have been greatly magnified. Peaches and strawberries are the main fruits with which experiments have been conducted, though the station is testing varieties of apples, pears and plums; and has recently added 100 Red June plum trees to its commercial orchard.

Peaches.—The one hundred Greensboro trees set out in December, 1902, all bore some fruit of good quality during the present year which was marketed locally and in nearby towns. The one hundred Elbertas with which fertilizer tests are being conducted have grown remarkably well, but did not bear fruit this year. So far as any conditions that have yet presented themselves are concerned, we have every reason to believe that peaches will do remarkably well here.

Strawberries.—Work with this crop has been to test the merits of varieties; to determine the best quantity and kind of fertilizer to use under them; and to market enough of the fruit to be able to get an intelligent idea of the business side of growing the crop in this section. The best results were gotten with the Klondyke variety, though the Lady Thompson and Excelsior both did well. The Cloud proved unsatisfactory, the fruit being small and soft and the vines rusting badly. We began gathering the Klondykes on March 23d and on April 1st were picking at the rate of from 300 to 400 quarts per acre daily. The Excelsiors were at least ten days earlier than the Klondykes but were not such good shippers. Six different combinations of plant food, furnished by cottonseed meal, acid phosphate, and kainit were tried under the Klondyke berries on one-twentieth acre plats using a mixture of 200 pounds of cottonseed meal, 200 pounds acid phosphate and

100 pounds of kainit as a unit application, one-half being applied at the first cultivation after the picking season was over, and the other half at the last cultivation in the fall.

Records were kept of the berries gathered between March 23d and April 28th inclusive, though the picking season extended through the month of May. It was impossible to keep the records longer on account of irregular picking due to a scarcity of labor.

When the three fertilizing materials were used in the proportions given above berries were gathered at the rate of 165.8 crates per acre; when 1000 pounds of oyster shells were added to this mixture 166⅔ crates were obtained; when the cottonseed meal and kainit were cut down one-half and the acid phosphate remained the same 160 crates; with cottonseed meal and kainit normal and the acid phosphate doubled the yield was 191.6 crates; when the cottonseed meal and acid phosphate remained normal and the kainit was left out entirely the yield was 163 crates; when the cottonseed meal and kainit were normal and the acid phosphate left out entirely the yield was 143.7 crates.

While these results are incomplete they are relative and evidently indicate that with berries, as with every other crop so far tested here, phosphoric acid seems to be the substance most seriously lacking in the soils.

Marketing berries.—In addition to one-half acre of ground devoted to some 150 varieties of berries, the station has 1.8 acres planted equally to Klondyke, Cloud, Excelsior, and Lady Thompson berries and these included the six plats of one-twentieth acre each devoted to the test with fertilizers. Very few berries were sold from the varieties and such as were sold did not bring good prices on account of being so badly mixed. Before the shipping season had been well begun the one-half acre planted to the Cloud variety was discarded and we were never able to keep the others picked closely on account of a scarcity of labor. It was impossible to market these berries farther North than Birmingham or Chattanooga and they frequently reached these nearby markets in bad condition, due to the poor shipping facilities. None of the fast trains stopped at McNeil and the local express train going north passed so early in the morning that it was impossible to pick the berries for it, therefore, they had to be gathered one day and kept over night and this caused them to reach the consumers in our best market, Cincinnati, twenty-four hours later than if gathered and shipped at the most opportune time.

The twenty four quart ventilated crate is the one demanded by

the trade; the baskets hold a full quart and are so placed in a crate made for them as to insure maximum ventilation.

Results obtained by using this crate were incomparably better than where the berries were shipped in the old flat cases. 275 twenty four quart cases were marketed from this patch and brought, shippers net, a little less than five hundred dollars. After the shipping season, which lasted very long, was over the plants were weak but soon recovered strength when fertilized and cultivated.

They grew well all the summer and until late fall, and more than 80,000 plants have been taken from the $1\frac{1}{3}$ acres, leaving more than a stand for the coming season.

Asparagus.—The first work done with crops after reaching McNeill in the spring of 1902 was to set out one-fifth acre in asparagus crowns, and one year later an additional half acre was put out. During the past spring we cut from this patch, for about one month beginning the 28th of February, and while some little grass was gotten from the one-year old patch, the most of it came from the one-fifth acre of two-year old crowns. This asparagus was marketed to far better advantage in Chicago, than in any other city. Twenty $\frac{1}{3}$ bushel boxes were shipped and gave shippers net returns of $30.00. One-fourth acre of land was planted in the spring of 1903 to asparagus seed, and during the past spring 35,000 crowns were sold from it. An additional patch was set out during the past spring with which the fertilizer requirements of the crop will be determined. This crop requires a very rich soil, but is almost sure to give profitable returns for any extra quantity of fertilizer it may receive. It is a very promising crop for this section so far as results have shown up to this time.

Cabbage.—Twelve plats of one-twentieth acre each were used to test the fertilizer requirements of cabbage. It was our intention to use cottonseed meal, acid phosphate, and kainit in five proportions, and to do the work on both parked and unparked land, leaving blank plats on each. However, the cabbage did not grow off satisfactorily and nitrate of soda, at the rate of 100 pounds per acre, was added to each of the twelve plats. This has made the fertilizer tests themselves less valuable, but in all probability the nitrate caused the cabbage to grow and head promptly when otherwise they might have lingered and been ruined by the drouth, as was the case the year before. The average of the six plats on parked and unparked land showed that the feeding of cattle on the parked land had increased the crop 3,173 pounds of cabbage which, at the price realized for these cabbage on the markets,

would make the droppings of the cattle worth $36.00 per acre to the second year's crop.

One thousand and fifty pounds per acre of fertilizer made up of 430 pounds of cottonseed meal, 420 pounds of Acid phosphate and 200 pounds of kainit was taken as a unit application per acre. The addition of oyster shells to this mixture did not increase the crop on either parked or unparked land. Every decrease of cottonseed meal or acid phosphate from the above mixture lessened the crop considerably, but leaving out kainit on the natural soil showed no disposition to decrease the crop at all. The results show that while the droppings of cattle are very beneficial to this crop, they do not lessen the need of commercial fertilizers, but make them all the more helpful. The percentage increase in yield of the average of five fertilized plats over no fertilizer was 223% on the natural soil and 299% on the parked land. Of course the presence of the same quantity of nitrate of soda on each plat would have some influence in determining these percentages, but it would hardly lessen the force of the argument that the parking of these cattle served to make the soil more susceptible to the effects of fertilizers.

In addition to the twelve twentieth-acre plats mentioned, the station had one-fourth acre of cabbage on land that had been parked and also had been fertilized with lot manure and commercial fertilizers. This was a prize patch and many visitors who saw the cabbage pronounced them as fine as they had ever seen grow. It had 2400 plants and fully 95% of them made first class heads. About $150.00 shippers net returns were realized from the two patches of ¾ acre and more than half of this came from the one-fourth acre. The blank plats, together, made too little to be worth counting. The Jersey Wakefield is the variety that has so far given best results. Three efforts have been made to grow fall cabbage, not one of which was successful.

Beans.—Wardwell's Kidney Wax, one of the best wax beans, averaged, on the five plats used, 120.8 bushels per acre; the Improved Valentine, a popular round green bean, growing alongside the wax beans, averaged 121.6 bushels per acre, counting 30 pounds as a bushel in both instances.

Fertilizer tests with these beans have shown this year, as in the two previous years, that the addition of kainit to a mixture containing cottonseed meal, dried blood, and acid phosphate does not give an increased yield, and that although the bean is a leguminous crop it grows so early in the season that a nitrogenous fertilizer is necessary. The natural soil made 66 bushels of beans per acre; an addition of

209 pounds of cottonseed meal, 114 pounds of dried blood, 455 pounds of acid phosphate, and 213 pounds of kainit gave 150 bushels per acre; one-half of the above fertilizer gave 121.5 bushels per acre; when the nitrogen was left out of the mixture the yield was 82 bushels; when the potash (except that of cottonseed meal) was left out the yield was 148 bushels; acid phosphate alone at the above rate gave 104.5 bushels

The station grew a total of two acres in beans, which when sold on the Northern markets, gave shippers net returns for $173.29. The wax beans brought a much better price than the round green, and the flat green beans would hardly pay the expense of shipping. It is not always the case, however, that the wax beans sell better than the round green, as this was reversed with us the year before. On the two acres grown here there was one-half acre in wax beans and one and one-half acres in green beans.

Package.—It was found that the bushel hamper was a much more desirable package for beans than the bushel box heretofore used and caused the beans to sell on the market for considerably more money. They also facilitated the packing of the beans to a great extent, it being easily possible to pack three hampers in the time required to pack one box. There is practically no difference in the cost of the two packages and none in the express charges.

Irish potatoes.—Tests with fertilizers under this crop failed to show any marked results due to the nitrogen, potash, and phosphoric acid applied, for the yield seemed to have been determined rather more by water than by fertilizer. Tests with five varieties of potatoes gave calculated yields in bushels per acre as follows: Peerless, 163; Tennessee Red Triumph, 146.5; Burbank, 182.5; Early Ohio, 126.8; Early Rose, 136.6. The Red Triumph brought better prices on Northern markets than any of the others. The station had practically two acres in potatoes, the larger portion of which were planted with home-grown seed. These seed potatoes had evidently deteriorated from having been grown for several years from small potatoes, in other words, they seemed to have developed the characteristics of runts. At least something due to having used these small home-grown potatoes for seed militated against them, for while the imported varieties gave the yield above mentioned, these seed planted alongside them under the same conditions only gave 70.6 bushels. For the two acres the station received shippers net returns for $112.00. The 90 pound sack is the favorite package in which to ship.

An experiment to determine the best size seed piece for planting resulted as follows: One eye pieces yielded 68.9 bushels and required

140 pounds of seed to plant an acre; two eye pieces, or quarters, gave 79.9 bushels per acre and required 310 pounds of seed; potatoes cut in halves gave 96.9 bushels and required 540 pounds of seed to plant an acre; whole potatoes, the size of guinea eggs, yielded 107.9 bushels and required 1200 pounds of seed to plant an acre. The seed used were home-grown.

Fall potatoes have been grown here for three years. No trouble has been experienced in getting a stand at any time, but none of the crops have ever given satisfactory yields whether planted medium, early, or late.

Tomatoes.—The station has failed to grow tomatoes successfully for two years. Each time the vines have been made to grow and fruit well, but the cotton boll worm, tomato trimmer, and the disease commonly known as blossom-end rot, have together made the crop an entire failure so far as profits are concerned.

Miscellaneous vegetables.—During the very early spring small quantities of onions, beets, radishes, kohl rabi, turnips, and rutabagas were planted. All of these did well except the onions, but none were marketed, profitably, except the beets, rutabagas, and turnips. Egg plants and pepper have been grown successfully, but have never been profitably marketed.

STAPLE CROPS.

Corn (Fertilizer test).—Thirty six plats, each one-twentieth of an acre in size, were fertilized in a number of different ways and corn planted on them by hand, using faint check rows to indicate where each hill was to be dropped. This gave exactly the same number of hills in every plat. The average of the blank plats gave 16.4 bushels per acre; 100 pounds of cottonseed meal gave 17.4 bushels; 200 pounds of cottonseed meal, 25.7 bushels; 100 pounds of dried blood, 15.4 bushels; 400 pounds of cottonseed, 23.4 bushels; 100 pounds of acid phosphate, 29.1 bushels; 200 pounds of acid phosphate, 29.0 bushels; 100 pounds of kainit, 20 bushels; 200 pounds of kainit, 18.3 bushels. A mixture of 42 pounds of cottonseed meal and 42 pounds of acid phosphate gave 29 bushels, which was practically the same yield as when three times as much of the same mixture was used; neither the addition of kainit nor lime to a mixture of 126 pounds cottonseed meal and 126 pounds of acid phosphate resulted in any appreciable increase of crop. A mixture of 250 pounds of acid phosphate and cottonseed meal gave practically the same yields whether the proportion was: one

part acid phosphate and two parts cottonseed meal; or equal parts of acid phosphate and cottonseed meal; or two parts cottonseed meal and one part acid phosphate.

The same quantities of nitrogen and phosphoric acid gave practically the same yields when supplied as cottonseed meal and acid phosphate; cottonseed meal and reverted acid phosphate; or raw ground bone in a finely divided state; i. e., they seem to show that the insoluble phosphoric acid of bones, the citrate soluble phosphoric acid of the reverted acid phosphate, and the water soluble phosphoric acid of acid phosphate had an equal value for crops. This is contrary to the generally accepted theory that water soluble phosphoric acid stands first in value to crops, citrate soluble phosphoric acid second, and insoluble phosphoric acid third; and may have been due to the fact that the 84 pounds of cottonseed meal and 232 pounds acid phosphate; 84 pounds of cottonseed meal and 414 pounds of reverted acid phosphate, and 166 pounds of ground bone required to furnish 6 pounds of nitrogen and 35 pounds of phosphoric acid per acre, were excessive applications, and therefore each might have furnished enough available plant food for a maximum crop without indicating the relative value of the unused portions. The above mixtures gave 35.4, 33.0, and 33.7 bushels of corn per acre respectively, the variation being easily within the limit of individual error.

The blank plat on the parked land gave 14.2 bushels more per acre than the blank plats on the natural soil and, unlike the results with cabbage, the addition of commercial fertilizers did not result in any increased yield. The soil seemed already to have as much plant food as the seasons would permit it to use on a crop having so long a growing period as corn, and requiring, relatively, so much water for its growth.

Corn (Variety test).—Twelve varieties of corn were planted early in March in one-twentieth acre plats, on land of uniform composition that had been used unsuccessfully the fall before to grow a crop of cabbage. This ground was fertilized before the corn was planted at the rate of 300 pounds per acre of a mixture of equal parts acid phosphate and cottonseed meal. This corn was in a lower portion of the field than the fertilizer test plats and suffered much less for rain, consequently, the fertilizer showed a greater effect.

While there are many things that always go to render tests with varieties unreliable, such as inequalities of soil, the unavoidable mixing of the grain due to cross breeding, the variations of the seed of the same variety, etc., still they have some value, and it is believed the following results are as accurate as they could well be made. The

yields are given in bushels per acre following the names of the varieties: Cocke's Prolific 51.6; Eureka 51.5; Blount's Prolific 46; Virginia White Dent 43.5; Holts Strawberry 41.1; Berry's Early Breadfield 40; Improved Southern White Snow Flake 39.8; Mosby's Prolific 37.3; White Majestic 36.2; Improved Golden Dent 32.5; Mexican June 31.6; Hickory King 29.4. The Mexican June corn was grown at the station, Berry's Early Breadfield was obtained from Major M. F. Berry, Pachuta, Miss., and all the other varieties were gotten from T. W. Wood & Sons, Richmond, Va.

Cotton (Fertilizer test.)—Exactly the same work with fertilizers, reported above as having been conducted with corn, was repeated with cotton. The average of two blank plats gave 220 pounds of seed cotton per acre; 100 pounds of cottonseed meal gave 350 pounds; 200 pounds of cottonseed meal 410 pounds; 100 pounds of dried blood gave 280 pounds of seed cotton; 400 pounds of cotton seed 300 pounds; 100 pounds of acid phosphate 650 pounds; 200 pounds acid phosphate 570 pounds; 100 pounds kainit 170 pounds; 126 pounds each of acid phosphate and cottonseed meal gave 700 pounds of seed cotton; 165 pounds ground bone gave 780 pounds per acre; 168 pounds cotton seed meal and 70 pounds of acid phosphate per acre gave 710 pounds seed cotton. The last three were the largest yields of seed cotton on the natural soil and the addition of neither kainit nor lime to a combination of acid phosphate and cottonseed meal gave any increase over the average of these figures.

The blank plat on the parked land gave 1100 pounds more of seed cotton than the average of the two blank plats on the natural soil. The addition of commercial fertilizers to the parked area did not, as a rule, materially increase the yield of cotton and was not profitable.

The parked land was the only portion of the farm on which anything like an average yield of cotton was obtained.

Cotton (Variety test).—Eleven plats of one-twentieth acre each were fertilized at the rate of 200 pounds acid phosphate and 100 pounds of cottonseed meal per acre placed in the drill and bedded upon. Eleven varieties of cotton were planted on these plats April 14th, being two weeks later than the fertilizer test plats had been planted.

Since these varieties were planted later they were more seriously affected by the excessively wet weather during the fruiting season. The stalks attained an immense size and bloomed incessantly, but practically all the forms shed before becoming bolls, and many of the large bolls fell off or rotted before opening. These varieties yielded as follows in pounds of seed cotton per acre: Allen's Long Staple

360; Griffin's Long Staple 220; Seabrook 150; Willet's Red Leaf 190; Jones' Improved 640; Excelsior 620; King 680; Parker's 610; Russels Big Boll 520; Peterkin 450; Black Rattler 180.

Cotton (Varying number of stalks per acre).—Ten plats of two rows each, these rows varying in width from three to four feet, and all of them 300 feet long, were fertilized at the rate of 300 pounds per acre of a mixture of two parts acid phosphate and one part cotton-seed meal. The cotton on these rows was planted April 15th with King's seed, using a rule to get them the distance wanted apart. This varied the number of stalks per acre from 3,630 to 19,360.

The wide rows made uniformly larger yields than the narrow ones, but the distance apart in the drill did not seem to exercise much control over yields.

The average of the plats with the rows 4 feet apart gave 742 pounds of seed cotton per acre; the average of 4 plats having rows 3.5 feet apart was 507 pounds per acre; and the average of 3 plats having rows 3 feet apart was 312 pounds per acre.

This was due to the extremely damp and cloudy weather of July, August and September, for similar tests, conducted the year before gave no such indications, but showed that cotton had a remarkable ability to adapt itself to most any reasonable distance of planting.

Cowpeas.—Tests were conducted with twelve varieties of cowpeas, but at the time the vines were ready to cut it was raining so frequently that they could not be handled so as to get results of much value. As a matter of fact, none of the cowpeas grown this year have borne fruit of any consequence, though they made an enormous growth of vines.

Practically all land except that on which cotton, cane, or sweet potatoes grew was planted in cowpeas at some season of the year, largely as a second crop. The peas grown as a second crop matured after the rainy season was over, and were converted into a very excellent quality of hay. As a rule, peas planted here early in the season have very little tendency to make fruit, while those planted the latter part of June, or in July, are likely to fruit heavily.

Sweet potatoes.—The station grew a total of four acres of sweet potatoes of which 1.3 acres were a first crop and the balance followed other crops, chiefly vegetables. The yields were very large and the crop has been a paying one. The quality of these potatoes is excellent, due to the sandy nature of the soil; and the merchantable potatoes of this crop were disposed of as they were gathered at 50 cents per bushel f. o. b. at McNeill.

The main crop was planted with a variety known locally as Dooly

Yams, but besides these, three other varieties were tested though not in a way to determine actual yields.

These varieties were: Extra Early Caroline; Yellow Nansemond; and Red Nose. Neither of them, however, proved so good as the Dooly Yam. The Extra Early Caroline made practically as large yield as the local variety, but sold at 10 cents less per bushel on the markets, while the other two varieties were away below, so far as yields were concerned.

Something over $250.00 worth of potatoes were sold in Birmingham, leaving all the small and cut potatoes either to be sold here locally, fed to stock, or planted for seed. Six tests to show the fertilizer requirements of this crop were conducted, but gave no results from which any very positive conclusions may be drawn. Small applications of fertilizer gave most economical results and practically as large yields were made after vegetables, as when the potatoes grew as a first crop. No additional fertilizer was required when these potatoes followed a vegetable crop.

Sugar cane.—Three-fourths of an acre of stubble cane was grown this year and the entire crop saved as seed for another year. In addition to this, about $1\frac{1}{8}$ acres of plant cane, one-half acre of which was grown on the fertilizer test plats, was grown and converted into 420 gallons of first class syrup. This syrup was all made to the same consistency by means of a saccharimeter and then put up into half barrels and jugs.

The immature tops of cane, saved the fall before and planted at that time where they were to grow, have again failed to give the results expected of them. The tops with only one matured joint on them were practically worthless, but they improved in results up to where five mature joints were left, though even these did not give a perfect stand and the canes that came from them were quite slender and remained so throughout the season.

Ten tests were made with fertilizers under cane, but the land used was not suited to the crop, being on a hill that was rather too rolling for ideal test plats. However, the seasons were favorable and heavy yields were made considering the character of the land. In this test a mixture containing 215 pounds cottonseed meal, 210 pounds acid phosphate, and 100 pounds of kainit was taken as a unit application per acre and gave a calculated yield of 47,200 pounds of cane per acre; this same mixture that gave the 47,200 pounds of blue cane yielded on another plat 41,400 pounds of ribbon cane; the addition of 1000 pounds of oyster shells to the above mixture gave 43,100 pounds; when the above mixture was doubled and one-half of it applied at

planting time and the other half July 13th the yield was 43,320 pounds; the double ration applied all at the time of planting gave 53,200 pounds; when the cottonseed meal and kainit in the mixture were cut down one-half and the acid phosphate remained the same the yield was 39,400 pounds; when the whole mixture was halved the yield was 32,800 pounds; when the kainit was cut to one-half and the other two ingredients remained normal the yield was 38,000 pounds; no fertilizer gave 16,600 pounds; when the acid phosphate and cottonseed meal remained normal and kainit was left out entirely the yield was 26,800 pounds.

These results seemingly indicate that kainit has had a wonderful influence on the yield of cane, but the difference in the yields were likely caused more by irregularities of soil than by the potash contents of the fertilizers themselves.

MISCELLANEOUS FARM CROPS.

Spanish peanuts.—Continuing the experiment begun last year to test the effect of lime on the quality and yield of peanuts, four plats were prepared in the spring, each one-twentieth of an acre in size, fertilized in four different ways and planted April 16th to Spanish peanuts. These nuts came up to a good stand and gave promise of a fine yield of both nuts and vines, but the excessive dampness of August and September caused the vines to die prematurely and then decay and the nuts to sprout badly in the ground.

These nuts were harvested as soon as weather conditions would permit and gave yields smaller than last year, but about the same so far as faulty pods were concerned. No difference as regards these faulty pods was perceptible to the eye in the several plats, though two forms of lime had been used alongside plats with no lime at all. The results showed that acid phosphate was the only fertilizer that these nuts required.

Cassava.—Seed cane sufficient for planting about three-fourths acre of cassava was obtained and from this practically half a stand was obtained on the land planted.

When the land was loose and mellow the stalks and roots grew to an immense size, but on land inclined to be compact and stiff the cassava was badly stunted. During the fall, a representative row of this cassava 150 feet long was dug and the roots weighed. When allowances were made for a few missing hills this cassava yielded in roots at the rate of 15,000 pounds per acre. This of course is likely more than could have been made from the best acre on the farm having a perfect stand, but it serves to show that a portion of the patch was

very fine. Soon after being dug the roots of the cassava began to decay rapidly, but when left in the soil they kept fresh indefinitely.

The main patch of this cassava was so located that the hogs had free access to it through the winter and it has furnished a very palatable diet of which they are very fond.

Cattle and horses, too, have shown a disposition to eat it ravenously. The main trouble with the crop seems to be in successfully saving the canes for seed. There are few crops that will equal it in tonnage on these sandy soils.

Subsoiling and tillage tests.—The same plats reported on last year under this heading were used again this year, though the land was not again subsoiled. It was assumed that the deep breaking given the subsoiled plats last year would still be effective this year. The plats devoted to corn were fertilized with equal parts acid phosphate and cottonseed meal, and those used for cotton with two parts acid phosphate and one part cottonseed meal, 300 pounds per acre being the rate at which it was applied in both instances. The corn used was Berry's Early Breadfield which was planted March 10th, and King Cotton seed were planted April 10th. These plats were cultivated after every rain, a Perry cultivator being used for the shallow cultivation and a Georgia stock with scooter point for the deep cultivation.

The deep cultivation was not continued after the crops attained any considerable size, say knee high for cotton and waist high for corn; after this time the Perry cultivator was substituted and the crops cultivated shallow.

Results.—With corn, deep preparation and deep cultivation gave 30.0 bushels per acre; deep preparation and shallow cultivation gave 33.3 bushels per acre; shallow preparation and deep cultivation gave 31.3 bushels per acre; shallow preparation and shallow cultivation gave 29.0 bushels per acre.

With cotton, deep preparation and deep cultivation gave 1090 pounds of seed cotton per acre; deep preparation and shallow cultivation gave 1100 pounds seed cotton per acre; shallow preparation and deep cultivation gave 850 pounds seed cotton per acre; shallow preparation and shallow cultivation gave 825 pounds seed cotton per acre.

In the plats testing deep preparation the land was broken and subsoiled to a depth of 18 inches during the spring of 1903 and to a depth of 5 inches during the spring of 1904.

In the plats testing shallow preparation the ground was broken 5 inches deep during both seasons. The deep cultivation was done at

a depth of 5 inches and the shallow cultivation at a depth of 3 inches.

Small grain.—Oats, wheat and rye were harvested this year from seed sown in the fall of 1903.

The oats gave fairly good yields, but the wheat and rye were complete failures. Each of these crops have been planted again this fall, largely in the paddocks near the barn where they have furnished a lot of grazing for the mares, mule colts, and hogs. Stable manure is being used on them all to try and overcome some of the defects of the soil that have heretofore operated against these crops.

Vetch, alfalfa, and crimson clover.—Last year one acre of land was especially treated with a view to getting it in condition to grow these crops successfully. This acre was first parked by the cattle during the winter of 1902-03. The land was then thoroughly prepared and planted to beans; when the beans were matured the ground was fertilized well with ox manure and planted to cowpeas which made an extremely heavy growth. These peas were taken off in September, a thorough seed bed prepared, and alfalfa sown on one-half acre, crimson clover on one-fourth acre, and hairy vetch on the remaining one-fourth acre. Half the land devoted to each of these three crops was inoculated with the germ peculiar to the crop itself.

The vetch came up to a perfect stand and the inoculated portion grew to be waist high and strong and vigorous, the uninoculated portion merely existed and looked to be on the verge of starvation all the while. The best vetch matured a heavy crop of seed which were hauled off with the hay and scattered over other land where they have since come up. Peas were planted on the one-fourth acre plat and harvested in September when the ground was broken and harrowed and left to the vetch.

Soon after this the vetch seed that had scattered out in the spring began to sprout and soon gave a better stand than had existed the year before.

The difference between the inoculated and uninoculated portions is still as great as ever, except near the dividing line over which the germ life is gradually extending.

The alfalfa did not show such a marked difference due to the inoculation, though the inoculated half maintained a fair stand through the fall and winter, while the uninoculated portion either did not germinate at all, or died while very young. At any rate the whole of the uninoculated portion had to be plowed up in the spring and planted over, while the other half was only replanted in spots. This alfalfa

planted in the spring regardless of whether the land was, or was not inoculated, came up to a good stand and grew off well. By the middle of July three cuttings had been gotten from this alfalfa, small of course, but very suggestive of heavy yields in future. Before this time, however, crab-grass had begun to appear and the patch had been gone over carefully two different times and the grass weeded out with hoes and by hand. The frequent showers after this made it impossible to keep down the grass and by September there was a complete carpet of grass which had effectively choked out the alfalfa. The ground was then plowed, carefully harrowed, fertilized, and resown to alfalfa, this time in drills two feet apart. The seed germinated well, but from some unknown cause practically all of the plants died. In view of these facts, it would hardly seem probable that alfalfa will make a money crop for this section in the near future.

The crimson clover seed failed to germinate at all in the fall of 1903, evidently being too old or spoiled. It was planted again in the spring and a good stand was obtained, but the plants never became strong enough to battle with the crab grass. It was planted again in the fall in drills two feet apart and like the alfalfa came up to a good stand only to die down a few weeks later.

Rape.—In the spring one-half acre of land near the barn was fertilized with stable manure and planted broadcast to cowpeas. These peas made a heavy growth of vines and were cut the latter part of August and saved for hay. The land was then broken twice at intervals of ten days, and thoroughly harrowed, and laid off into rows $2\frac{1}{2}$ feet apart. A mixture of equal parts acid phosphate and cottonseed meal was then distributed and mixed in the drill at the rate of 250 pounds per acre. Dwarf Essex rape seed were planted in these drills and harrowed in lightly. The rape came up to a perfect stand, grew off vigorously, and has furnished more grazing than 25 hogs and shoats could consume through the winter, though it was grazed while the hogs were feeding upon other crops such as chufas, cassava, and artichokes.

Bermuda grass.—Bermuda grass seed were sown over five acres of freshly cleared pasture land and a perfect sod was obtained from which a great deal of grazing was gotten the first year. This was done easily and cheaply by first breaking the sod land once with a single horse turn plow, distributing a mixture of two parts acid phosphate and one part cottonseed meal over it at the rate of 200 pounds per acre. This fertilizer was then harrowed into the soil, breaking up the sods at the same time, by running over the land with a smoothing harrow having the teeth almost perpendicular. Some 3 or 4 pounds of ber-

muda grass seeds, mixed thoroughly in 50 pounds of cottonseed meal, were then distributed over each acre of land and harrowed in lightly, using a roller after the harrow in case of dry weather. This grass, of course, came up very thinly but soon began spreading and by the middle of summer that sown in April had sodded the land, while other seed sown the latter part of June had practically sodded the land by frost. With a small application of fertilizer this grass furnishes excellent grazing here from early spring until late fall, except in the dryest weather and it quickly recovers from the effects of these droughts. In combination with vetch and bur clover, both of which with good treatment will grow well here, this bermuda should furnish pasture for cattle at least nine months in the year.

During the latter part of July the main station building, being used at the time as a residence and office, was struck by lightning and set on fire. As no one was in the house at the time the fire was not discovered soon enough to save any of its contents. All important records were in the safe at the time and escaped entire destruction. This fire has hindered station work to a large extent, since the greater part of the summer and fall had to be spent in rebuilding and refitting the residence and office. The old house was insured for $1500.00 with which sum a single story residence was built on the same spot.

An office with two rooms has been built nearby it, but far enough away that the burning of one would not necessarily endanger the other.

The two buildings make a much more satisfactory arrangement than the one heretofore existing.

The main work of the station has been, and possibly always will be, to obtain information, whether this be of a positive or negative character, but it has made every effort, consistent with its duties as an experiment station, to be an object lesson to the people of this section and to demonstrate, in a practical way, just what certain crops will do, both as to yields and financial results, when grown here on a commercial scale. The results of this particular feature of the work have been very gratifying, especially during the past year, for they have shown that at least several representatives each of fruit, vegetables, and general farm crops may not only be grown here successfully, but be marketed at a profit.

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REPORT OF FIELD WORK DONE AT THE COLLEGE STATION FOR 1904.

W. R. PERKINS.

Varieties of cotton.—The testing of varieties of any crop has very few of the elements of scientific investigation in it, yet it is very necessary, otherwise there would be no way of ascertaining the relative merits of the different varieties of the same plant. Such a test to be of any value whatever must be so conducted that the results obtained will not be influenced, to an appreciable degree, by differences existing in the soils. So variable is the land of the Station field and over most of this State that it is almost impossible to find a uniform soil of sufficient area to conduct such experiments. It is very apparent that when plats of one-eighth or one-tenth of an acre are laid off on land that varies in fertility, some of them will be on soil more or less productive than others. Results from such plats can be foretold at planting time and consequently are of no value. We have attempted to avoid this error by planting crops for such tests in one row plats. When one row of each kind has been planted, move up and plant another series in regular order and so on till the plats have been repeated ten or more times. In this way there is a more equitable division of thin and productive soils among the different plats.

The test this season contained fourteen varieties of cotton—ten short staple and four long staple. With one or two exceptions the varieties selected were such as are pretty generally grown in the state.

Full data concerning the yields, ginning, classification, and valuation are given in the following table:

Table 1 Yield of Varieties of Cotton—1904.

Rank according to Total Value of Crop.	NAME OF VARIETY.	Pounds per acre, first Picking.	Pounds per acre, 2nd Picking.	Pounds per acre, 3rd Picking.	Total seed cotton per acre.	Per cent. of total gathered Sept. 6th.	Pounds of lint in 100 lbs. seed cotton.	Pounds of lint per acre.	Pounds of Seed per acre.	Classification of lint.	Length of staple.	Price December 28th.	Value of lint per acre.	Value of seed per acre, at $12.00 per ton.	Total value per acre.
1	Cook's Improved	612	984	148	1744	35.0	36.7	640	1104	Middling Fair	1 in.	6 5/8	$42.40	$ 6.62	$49.02
2	Prize	425	1023	135	1583	26.8	39.1	619	964	Strict Good Middling	1	6 1/2	40.23	5.78	46.01
3	Hawkins	400	1063	136	1599	25.0	34.3	548	1051	Good Middling	1	6 1/4	34.25	6.30	40.55
4	Schley	453	968	139	1560	29.0	33.3	520	1040	Strict Good Middling	1 1/8	6 3/8	33.80	6.24	40.04
5	Russell Big Boll	304	1033	284	1621	18.7	32.1	520	1101	Good Middling	1 1/8	6 3/8	33.15	6.60	39.75
6	Truitt	452	905	147	1504	30.0	31.4	472	1032	Good Middling	1 1/8	6 3/8	30.09	6.19	36.28
7	Gayoso Prolific	433	950	117	1500	28.8	32.1	482	1018	Strict Middling	1	6 1/8	29.52	6.10	35.62
8	Edgworth	389	928	147	1464	26.6	31.0	454	1010	Good Middling	1 1/8	6 3/8	28.94	6.06	35.00
9	King	516	659	118	1293	39.9	36.2	468	825	Good Middling	1	6 1/4	29.25	4.95	34.20
10	Berry's Big Boll	409	666	135	1210	33.3	28.9	350	860	Strict Middling	1 1-16	6 1/8	21.43	5.16	26.59
	John Bull—long staple	519	793	136	1448	35.8	29.3	424	1024	Good Middling	1 1/2	11	46.64	6.14	52.78
	Cook's Long Staple	333	841	127	1301	25.5	32.7	425	876	Good Middling	1 1/2	11	46.75	5.75	52.00
	Allen—long staple	459	869	106	1434	32.0	27.5	394	1040	Good Middling	1 1/2	11	43.34	6.24	49.50
	Griffin—long staple	355	661	105	1121	31.5	29.7	333	788	Good Middling	1 3/8	10	33.33	4.72	38.05

The land on which the test was made is what might be classed as second quality bottom soil, some of it being good but grading off in about half of the plat, to a rather thin soil. The variety test of last season was made on the same land, no fertilizer having been applied either year. The soil was well and deeply broken in February. Nothing further was done to it till about the first of April, when it was thoroughly disked across the breaking furrows. This cut up the cotton stalks and left the soil in fine mechanical condition. It was put into four-foot beds a few days later with one horse plow, and planted April 12th. The cultivation was done with the ordinary single horse implements, viz.: side harrow, five-tooth cultivator, Perry cultivator, and cotton sweep. After coming up the crop received no set-backs till mature, except an attack of the boll-worm in August, which almost totally destroyed the "top crop."

With the short staple varieties there is much variation in yield of seed cotton, in the per cent. of lint, and in the total amount of lint produced per acre; the latter being the most important consideration in the profitable growing of this crop.

When the yield of the two standard "pure bred" varieties will differ as much as 33⅓ per cent., or more, of the smaller yield, it proclaims very forcibly the loss sustained by the farmer who grows the poorer kind, and should impress every cotton grower with the importance of having the best and of constantly striving to improve or, at least, to keep a good variety up to its present high quality.

It is not claimed that this, or any other comparative test is absolutely correct in its results as to relative merits. Under different conditions of soil or season, the varieties in the above test might show some slight variation in their relative productiveness, but we believe that such variation would be small.

Varieties.—Cook's Improved.—Seed obtained from J. R. Cook, Schley, Ga. The first trial we have given this cotton. It has medium to large boll and medium size gray seed. One of the best yielders of both seed cotton and lint we have ever grown.

Prize.—Seed from W. B. F. Lewis, Lewiston, La. Bolls rather small with small seed. Has been tested for several years, and has

always stood near the top in value of crop. Yields a higher per cent. of lint than any variety tested.

Hawkins.—A well known variety and first class in every particular. Medium size bolls and seed. Seed obtained from B. W. Hawkins, Nona, Ga.

Schley.—A new variety originated by the Georgia Experiment Station, Experiment, Ga.

Russell or Ozier Big Boll.—Seed from J. D. Ozier, Corinth, Miss. Large boll with large green seed. One of the most extensively grown and reliable varieties planted in Mississippi. Is especially adapted to good upland. On rich valley land, is too late in maturing to be relied upon.

Truitt.—Seed from Alexander Seed Co., Savannah, Ga. A well known and valuable variety, with large boll and large seed.

Gayoso.—Seed from R. A. Green, Church Hill, Miss. Small boll with most of the seed black and close akin to Peterkin in general appearance.

Edgeworth.—Seed from J. C. Little, Louisville, Ga. Medium boll and seed. Made the largest yield of seed cotton of any variety tested in 1903.

King.—Seed from Alexander Seed Co., Savannah, Ga. Well kyown as an early variety, nearly 40 per cent. of the crop being gathered the first week in September.

Berry's Big Boll.—Seed from W. P. Huckaby, Experiment, Ga. Large boll and seed. Did not yield well, possibly due to unfavorable season.

John Bull.—Long staple variety. Seed from Pike county, Miss. Makes a good yield and is comparatively early.

Cook's long staple.—Seed from W. A. Cook, Newman, Miss. Similar in quality of lint to John Bull and Allen, but turned out a higher percentage of lint.

Allen.—Seed from J. B. Allen, Port Gibson, Miss. The best known of any of the long staple kinds with fine quality of lint,and good yielder.

Griffin.—Seed from Mr. Griffin, Greenville, Miss. Good length fibre, but possibly on account of having been bred in alluvial Delta region was not so well adapted to soil conditions with us.

Long vs. short staple cotton.—The best kind or variety of cotton for the farmer to grow is undoubtedly the one that produces the most dollars and cents per acre. The figures in the table would indicate that the long staple varieties surpass the short staple in this particular, but it should not be taken as true under all circumstances, as that depends very much upon the relative price of the two. When the varieties of cotton were gathered, the short staple cotton was worth in our local market ten cents per pound, and the long staple twelve and a half cents per pound. With only two and a half cents difference in price per pound, the best short staple variety surpassed the best long staple over $9.00 per acre, and several of the short kinds were above the staple cotton in value per acre. The average yield in lint of the best five short staple kinds is over 44 per cent. above the average of the long staple varieties, while the poorest five of the former are 13 per cent. above the long staple varieties. Or the average of the ten varieties is 28.5 per cent. above the staple cottons in yield of lint. To balance them in value, the price of long staple cotton would have to average 28.5 per cent. higher per pound. This it usually does when the ordinary cotton is at the present level of prices—about six cents per pound.

The growing of long staple cotton is not always the most profitable even with prices as they are now, unless certain precautions are observed. The cotton must be pure and not mixed with ordinary cotton in handling or ginning, as a mixture of the two can only be sold at short staple prices. Some seasons the last picking of long staple cotton is inferior in quality, due to poor development of the bolls, and sells at a reduction. By planting only pure seed of good variety on productive bottom land that has been thoroughly prepared, and giving the crop proper tillage, good results in value of crop can be obtained with this cotton. Poor soil cannot be depended upon to produce a staple of sufficient length to command a price much in advance of that paid for short staple.

Varieties of corn.—Ten varieties of corn were grown in the test, most of which were obtained from seedmen, and included those va-

rieties most largely advertised and sold to the farmers of the State as pure-bred corn.

The same criticism made last season in regard to varieties of corn commonly grown in the South will bear repetition. Very few of the varieties we have procured, either from seedmen or from private individuals, show sufficient uniformity of ear, grain, or stalk to entitle them to the name of variety. Frequently the same variety in name, obtained from two sources, will be entirely different in almost every characteristic, except color. So apparent is this lack of quality in the so-called pure varieties of corn, that are offered for sale in the State, that it is almost a waste of time to attempt to get at the relative merits of them, and can certainly have very little influence on the agriculture of the State.

The best suggestion we can make at this time is to get seed corn from your own field, if you have a satisfactory kind, otherwise secure your seed from some home grown source of a kind that you know to be reliable and satisfactory. When a start is made with corn that produces well, then begin to improve it by selecting ideal ears from the right kind of a stalk in the field. In this way, in course of time, if selection is constantly made of one kind of corn, most of the irregularities of color, shape, and grain will be gotten rid of and a pure variety be the result.

Owing to our having some corn breeding work in progress with Mosby corn as the basis, and the field not being large enough to prevent cross pollination, a method had to be adopted by which this would be prevented. Consequently every other row in the variety patch was planted in Mosby corn and the alternate rows in the different varieties. These last rows were all detasseled as soon as the tassels appeared, allowing the Mosby variety to fertilize all of the other varieties. The corn was planted May 10th and encountered both the early and late drought which may have affected some varieties more than others.

The following table gives the yield by plat and per acre:

Table 2. **Yield of Varieties of Corn.** 1904.

NAME OF VARIETY.	Pounds of ear corn per plat.	Pounds of ear corn per acre.	Bushels of corn per acre.
Hick's Improved Marlboro	366	4022	55.8
Columbian White Mammoth	343	3769	52.3
Mosby's Prolific	320	3517	48.8
Cock's Prolific	319	3505	48.6
Early Breadfield	293	3220	44.7
Marlboro	267	2934	40.7
Poor Man	264	2901	40.3
Hickory King	253	2780	38.6
North Carolina White	244	2682	37.15
Snowflake	220	2417	34.96
Boone Co. Special	203	2230	31.07

Soja or Soy beans.—This is a leguminous plant and such favorable results were obtained with it last season both in the production of hay and grain, that we shall continue to grow it. The yields for this season, while not so large as for 1903, are sufficient to justify the claims made for it in the report of work for that year. When cut at the proper stage it makes a hay of fine quality, either to handle loose or to bale and stock of all kinds are fond of it.

Sheep are especially fond of the beans and the hay has been found a perfectly satisfactory feed on which to winter these animals.

The yield from four varieties is given below:

Yield of Soja Bean Hay.

NAME OF VARIETY.	Source of Seed.	Pounds of hay per acre.
Japanese No. 15	Home grown 2nd year.	3880
Japanese No. 16	Home grown 2nd year.	4333
Japanese No. 17	Home grown 2nd year.	4333
Mammoth Yellow	Home grown 2nd year.	6148

The Japanese produce a much smaller stalk, but are very prolific bearers of beans and are much earlier.

Johnsongrass hay.—In 1903 a plat of land was put in Johnson grass with the view of determining what improvement could be made in the crop by giving the land very thorough tillage before seeding and from the use of cottonseed meal and nitrate of soda as a fertilizer. The land received several plowings during the winter and spring of 1903, and in grading the surface to secure proper drainage it was thoroughly pulverized to the depth of a foot. Dry weather prevented the sowing of the seed till May 18th at which date the fertilizers were applied and the seed sown.

The same plat of land has been kept in the grass this season without further tillage except to disk and harrow in the spring, being fertilized again in a manner similar to that followed last year. The tables following show the amount of fertilizer applied and the yield of hay on the different plats for the two seasons.

Table Showing Yield of Johnsongrass Hay. 1903.

Number of plat.	Area.	Cottonseed meal lbs. per acre.	Nitrate of Soda lbs. per acre.	Yield 1st Cutting.	Yield 2nd cutting.	Total yield plats pounds.	Yield per acre pounds.	Yield per acre tons.
1	.0724 A.	.....	.....	350	350	700	9668	4.83
2	.0652 A.	460	.....	400	360	760	11656	5.82
3	.066 A.	.....	189	390	390	780	11818	5.91
4	.0668 A.	187	94	380	360	740	11077	5.54
5	.068 A.	.....	*184	340	330	670	9853	4.92
6	.1157 A.	.....	.....	470	400	870	7519	3.75

* Half applied at time of planting half after first cutting.

Table Showing Yield of Johnsongrass Hay. 1904.

Number of plat.	Area	Cottonseed meal lbs. per acre.	Nitrate of Soda lbs. per acre	Yield in lbs. 1st cutting.	Yield in lbs. 2nd cutting.	Yield in lbs. 3rd cutting.	Total yield in lbs. per plat	Total yield in lbs. per acre	Yield per acre tons
1	.0724 A.			270	310	180	760	10479	5.24
2	.0652 A.	250		120	360	160	640	9816	4.91
3	.066 A.		150	170	410	150	730	11060	5.53
4	.0668 A.	100	100	160	260	154	574	8593	4.29
5	.068 A.		*150	155	200	140	495	7279	3.64
6	.1157 A.			130	220	155	505	4364	2.18

*Half applied at time of planting, half after first cutting.

The soil in this plat of land improves in quality from No. 6 to No. 1, where it is good alluvial bottom land. Two cuttings of hay were secured in 1903 and three cuttings in 1904. Plats No. 1 and No. 6 received no fertilizer either year; yet the yield of hay in 1904 was greater on No. 1 than it was in 1903 and much less on No. 6. The natural fertility and the lasting effects of the tillage given the soil in 1903, easily explains this apparent inconsistency.

Assuming that there is a uniform decrease in the productiveness of the plats from No. 1 to No. 6, the average yield of these two plats would represent what the average yield of the whole plat would have been without fertilizer. The average of the other four plats should represent the yield, with an average of the fertilizer application given to the four plats.

The following figures show the comparison:

Average yield of hay per acre from Nos. 1 and 6 ..... 3.71 tons.
Average yield of hay per acre from Nos. 2, 3, 4 and 5..... 4.59 tons.
Average application of fertilizer ..... Cottonseed meal 87½ lbs.
Nitrate of soda 100 lbs.

Cost of fertilizer per acre..... $3.87
Increase in crop due to fertilizer..... .88 tons
Value of increase @ $10 per ton..... $8.80
Profit in fertilizer per acre..... $4.93

These figures would apply only on land in good physical condition and where there is a good stand of grass.

A second plat of land was put in Johnson grass in the spring of 1904, with the view of trying different treatment in handling such a meadow.

Three plats were put in the area, the yields from which during the season are as follows:

Area	Number of plat	Fertilizer applied lbs. per acre.	Yield 1st cutting in lbs.	Yield 2nd cutting in lbs.	Yield 3rd cutting in lbs.	Total yield per plat in lbs.	Total yield per acre in lbs.	Yield per acre in tons.
.81	1	200 lbs. cottonseed meal	710	640	664	2014	2486	1.24
.28	2		138	310	362	810	2893	1.45
.26	3		467	240	300	1007	3873	1.93

Fertilizer was applied on the first plat only, and both the first and second plats were seeded at the rate of two bushels of seed per acre. Plat No. 3 was already well covered in the grass, besides being the best plat of land.

Very little grass was growing on plat No. 1 previous to this season, while No. 2 had about half of a stand of the grass. The grass from seed on these plats was almost a failure, for the following reasons: The seed were sown too early and the weather being both cool and dry they failed to come up promptly and the crab grass got such a hold on the land that Johnson grass failed to make a satisfactory growth. This is a common experience in sowing Johnsongrass seed. They do not do well until the weather becomes warm and when planted too early almost invariably prove a failure the first year. Nor can results be expected the first year from the sowing of these seed on rough or poorly prepared soil The land should be thoroughly fined and the seed planted in a moist warm soil, not earlier than the middle of April or first of May in this latitude. The seed on plats No. 1 and

No. 2 above came up to a good stand and held through the summer, but could make no growth on account of crowding by crab grass. It should be a good stand the following spring and make a full crop of hay.

Alfalfa—The popularity of alfalfa as a forage plant continues to grow and we submit below our experience with it during the past year. Four small areas were planted in the spring of 1904 embracing about four acres in all.

Good stands were secured in every instance and still remain on two of the plats.

The first plat is a stiff piece of valley soil. It was in corn and Johnson grass in 1903. Owing to the great amount of stalks from the previous crop and to the very bad physical condition of the soil it was not gotten in perfect condition before planting, still a good stand was obtained. Three light cuttings of hay were secured during the summer, amounting to about two tons of field cured hay on an acre and a half. The stand is still good with the exception of a small area in one corner where the red hill soil extended into the valley. On this crab grass made its appearance early in the season and the alfalfa never amounted to anything, finally dying out almost completely.

Another small area of black (prarie) hill land was planted at the same time and on which the stand is good. The other two plats were of a sandy loam texture and had very little cultivation the previous year. One of these was in perfect condition when planted and the seed came up right away, but the crab grass came with it and the alfalfa soon died. The same result attended the fourth plat.

The first two plats were planted February 27th. The third March 10th and the last April 2nd. The seed in every instance were inoculated with material furnished by the U. S. Department of Agriculture. On the stiffer character of soil where crab grass is not so very troublesome, we have had no difficulty in getting alfalfa established when the soil is well prepared before planting, but on soil of a sandy or loam nature, the question is much harder to solve. The successful growing of alfalfa on such soils must be determined by some method that will effectually subdue crab grass.

We would suggest two methods that we believe worthy of trial. The first is to apply a good dressing of stable manure to the land in the spring and plant in cotton, giving the land thorough and clean cultivation. As soon as the cotton is gathered in the fall, cut up or remove the stalks and subsoil the land. Allow it to stand rough through the following winter and prepare the seed bed in February or March, when the land is in proper condition, with some light implement, giving it only shallow tillage. Have the seed inoculated and plant as early in March as weather conditions will permit. September is the best time to sow the seed, but we do not have, on the average, more than one year in five when there is sufficient moisture in the ground to enable one to prepare the soil and plant at that time.

The other method we would suggest is to select a good piece of soil. Do the deep plowing as early in the spring as possible, then keep the surface constantly cultivated through the spring and early summer months and sow the seed during the rainy spell that usually occurs in August. We have never tried this latter method, but will do so this season. Sow, in all cases, about twenty-five pounds of good seed per acre. The cultivation given the soil should be frequent enough to keep down all grass and weeds and to prevent a crust forming in the field. Material for inoculating the seed or soil can be purchased from seedmen at about $2.00 for sufficient to inoculate an acre. We will ship soil for the same purpose that will cost you only the freight on 200 pounds of soil from the college.

Comparative value of oats, cowpeas, and corn for the production of forage—Owing to the fact that a great many farmers in the state depend almost exclusively on the corn crop for the production of feed for their work stock, the question has arisen in our minds as to whether more forage, equally as good, could not be produced from other crops, and that, too, at less expense per acre and with less wear on the land.

In bulletin No. 84 of this Station, some comparisons were drawn between a crop of wheat hay followed by cowpeas and a corn crop, all grown on productive soil; a crop of Johnson grass, on the same quality of soil, also, entered into the comparison.

To make a further study of the question on a soil of poorer quality, a piece of land was set aside in 1904, and planted in duplicate plats,

as follows: Plat Nos. 1 and 6 were planted in corn and "laid by" in cowpeas. Plats Nos. 2 and 5 were planted in cowpeas, and plats Nos. 3 and 4 in oats followed by cowpeas. The table following gives the yield of the different crops and their comparative value at what we consider fair prices:

Comparative yield of oat and cowpea hay, cowpea hay and corn

Number of plat	Area	Crop grown	Yield in lbs. per plat.	Yield per acre in lbs.	Value of crop per acre. Corn at 50c per bu.; cowpea hay at 50c per 100 lbs.; oat hay at 40c per 100 lbs.
1 and 6	.35 A.	Corn	720	2057	$14.14
2 and 5	.35 A.	Cowpea hay	1025	2929	14.63
3 and 4	.35 A.	Oat hay Cowpea hay	710 560	2028 1600	16.11

The yield of corn was slightly more than 28 bushels per acre, which is more than double the average corn production of the state per acre. The season was favorable to the growth of the corn and the yield was doubtless above the average capacity of the soil on which it grew. The other crops do not appear phenomenally large for the land. No record could be made of the cowpeas grown in the corn as the crop was too small to permit of its being harvested. Usually the best way to handle peas in corn is to allow the stock to consume it in the field which will of course add some value to the corn crop.

We believe that on soil that will not produce over ten or fifteen bushels of corn per acre more feed can be produced with either of the other crops, and the land will undoubtedly be improved by growing them.

TUCKER PRINTING HOUSE, JACKSON, MISS.

Misssissippi Agricultural Experiment Station.

BULLETIN No. 89.

THE UNDERGROUND WATERS OF MISSISSIPPI

A PRELIMINARY REPORT

—BY—

W. N. LOGAN AND W. R. PERKINS

FIG. 1.—AN ARTESIAN WELL AT COLUMBUS, MISS.

AGRICULTURAL COLLEGE, MISS.,
January, 1905.

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INTRODUCTION.

THE following preliminary report on the underground waters of Mississippi is intended to meet, in a measure at least, the constantly increasing demand for information upon this subject by present and prospective citizens of the state.

The report embodies our present knowledge of the depth at which potable underground waters may be obtained in different parts of the state; the known and probable artesian areas of the state; and the chemical properties of the underground waters in the various parts of the state.

It is probable that no state in the Union is the possessor of a more abundant supply of potable underground waters, available in nearly all parts of the state, than Mississippi. From information given in this report it may be seen that there is scarcely a county in the state in which deep underground water is not available in some part of the county. From this fact alone it becomes evident that this report is dealing with one of the state's most valuable resources,—the development of which is closely associated with its material prosperity and the physical well being of its people.

The questionable sanitary condition of the surface and shallow-well waters in many parts of the state has made the investigation of the availability of deep underground waters not only desirable but in many instances imperative. And so rapid has been the development of this resource that already a majority of the towns of the state are drawing their supply of water for public use from deep underground sources.

In the preparation of this report the authors wish to acknowledge their indebtedness to the following named citizens who have contributed much information in regard to the deep wells of the state: Messrs. Frank Suter, Pass Christian; P. T. Doyle, Hattiesburg; J. M. Jenkins, Lumberton; R. B. McVay, Tupelo; G. M. Garrundet, Oxford; W. H. Reeves, Aberdeen; S. W. Stanley, West Point; T. B. Minyard, Greenwood; G. M. Ladd, Macon; L. L. Eaves, Tupelo; W. W. Griffiths, New Orleans; R. B. Schalter, Schalter; and many others.

ORIGIN OF THE UNDERGROUND WATERS OF MISSISSIPPI.

The underground water of Mississippi comes from two sources. The first and by far the more important source is the annual rain-fall.

Another source of supply is the waters of surface streams which cross pervious layers of rock.

Precipitation as a source of supply.—The average annual rain-fall of the State is between 50 and 60 inches. Estimating it at 54 inches, the amount of water falling upon each square mile of surface is 125,516,800 cubic feet or about 1,466,331 gallons per acre during each year. Of the water which falls upon the surface a part is evaporated, a part is carried away by the surface streams and a part passes into the rocks and becomes the source of underground waters. These underground waters flow in some pervious layer toward the Gulf and doubtless ultimately mingle with the waters of that body as is true of the surface streams.

That part of the water which is carried away by the surface streams is termed the run-off. The amount of run-off is dependent upon a number of factors, chief among which are:

1. The degree of inclination of the drainage area. The higher the degree of inclination of the slopes the greater the run-off.

2. The character and position of the rocks composing the surface of the drainage area. Impervious rocks inclined with the surface of the area will add greatly to the amount of run-off.

3. The topography of the drainage area. An area of high altitude may have a small amount of run-off if the surface is comparatively level and especially if there are a large number of shallow basins for impounding the water.

4. The character and quantity of the vegetation. Forest covered areas will contribute less water to the run-off than prairies; and grass covered areas less than areas of sparse vegetation.

5. The rate of precipitation. The more rapid the rate of precipitation the greater the amount of run-off.

Dana has estimated that one fourth of the annual precipitation of the Mississippi basin is discharged by that river. If this estimate is correct it means that three fourths of the above amount of water is left for evaporation and underground supply. At present, data for making even an approximate estimate of the amount of water lost yearly in Mississippi by evaporation is lacking. It may be safely assumed, however, that the amount is not large because of climatic conditions and the large areas of forest which conserve the moisture and prevent rapid evaporation. It seems, therefore, entirely within the

range of probability that from one third to one half of the water which falls upon the surface reaches the underground courses, becoming a part of that water supply.

Hall estimates that the area drained by the Tombigbee river (above Columbus) is 4,440 square miles and that the run-off for 1900 was 28.18 inches; for 1901, 18.74 inches; for 1902, 18.87 inches, and 1903 19.88 inches. The average for the four years is 22.22 inches or about 40 per cent. of the annual rain-fall. This is about 15 per cent. higher than the estimate referred to above. This area, however, has a larger run-off than other areas of the state.

The area drained by the Pearl river above Jackson is about 3,636 square miles. The mean discharge as given by Hall for the year 1903 was 3,782 cubic feet per second; hence the run-off is about 14.02 inches which is about 26 per cent. of the annual rain-fall.

It is not unlikely that the Tombigbee drainage area has the maximum run-off of the Mississippi drainage areas. The reasons for this assumption are to be found in:

1. The laltitude of the area,—the lands drained by the Tombigbee being among the more elevated in the state.

2. The character of the surface rocks. Much of the surface of the Tombigbee drainage basin is occupied by the impervious Selma chalk.

3. The paucity of vegetation as compared with other areas. The area occupied by the Selma chalk is largely a prairie region and sheds its water more readily than the forest regions.

Streams as a source of underground supply.—Some of the streams of the state may be said to contribute almost constantly to the underground water supply. The larger streams cross the out-crop of many porous beds and at such points doubtless lose some of their water to the underground courses.

The Tombigbee river, for instance, flows for a considerable distance with the Tombigbee sands forming its western bank or in a channel cut in the eastern border of that formation. There is doubtless a constant loss of water from this river to the porous stratum. The loss is especially large when the river is at flood stage and the water rises high up against the sandy banks.

The Chickasawhay river contributes in the same way to the water-bearing strata of the Buhrstone and Claiborne. It is said there is a noticeable increase in the flow of the wells at Enterprise when this

river is at flood stage. The amount of water contributed to the underground supply by streams is small compared with the amount derived directly from precipitation.

Artesian Waters.

The term, "artesian water," as now used in Mississippi admits of two interpretations. By some it is used to indicate water which flows from the mouth of the well. By others it is used to indicate water which rises in the well irrespective of whether it flows from the mouth of the well or not. The former interpretation is given the term in this report and the term "hydraulic water" will be used to designate the latter class of waters.

The stratigraphical conditions essential to the formation of an artesian area are, in brief, as follows:

1. A collecting ground or catchment basin located at some point higher than the proposed artesian well.
2. A porous, inclined, rock stratum leading from the collecting ground to some point below the mouth of the proposed well.
3. The confinement of the porous stratum between impervious rock strata.

These conditions are illustrated by the section from Aberdeen to Starkville. The Tombigbee sand is the porous stratum enclosed between the impervious Selma chalk above and the Eutaw clays below. These strata are inclined or dip toward the southwest. The porous stratum outcrops at Aberdeen and is reached at a depth of about 850 feet at Starkville. The catchment basin is the Tombigbee river basin about Aberdeen.

When the water sinks into the porous stratum its first tendency is to flow downward since it is acted upon by gravity. The downward flow continues until an impervious stratum is reached. The water then flows along the surface of this impervious layer, following its dip, until a point is reached where the influence of gravity is overcome by hydrostatic and rock pressure. At such a point the water will rise toward the surface unless checked by an impervious stratum. Wherever this upper impervious layer is pierced by the drill the water rises. And if the mouth of the well be lower than the source of the water, i. e., the catchment basin, artesian water may be obtained.*

**For a full discussion of "the requisite and qualifying conditions of artesian wells" the reader is referred to an excellent treatment of this subject by Dr. T. C. Chamberlin in the 5th Annual Report of the U. S. G. S., 1885, pp. 125-173.*

THE DRAINAGE BASINS OF MISSISSIPPI.

The principal drainage areas of the State are:

The Tombigbee basin drained by the upper part of the Tombigbee river and its branches.

The Pascagoula basin, drained by the Pascagoula river which is formed by the conjunction of the Leaf river and the Chickasawhay river.

The Pearl river basin, draining to the Gulf through Lake Borgne.

The Big Black basin, draining to the Mississippi. The smallest of the basins.

The Yazoo basin, draining to the Coldwater, the Tallahatchie, the Yallobusha and the Yazoo, and entering the Mississippi which receives the drainage of the western part of the state.

STREAM MEASUREMENTS.—Very little hydrographic work has been undertaken in Mississippi and our knowledge of the streams is limited. A recent report on the "Water Powers of Alabama" by B. M. Hall* contains an appendix on "Stream Measurements in Mississippi." To this report we are indebted for the following facts in regard to the streams of the State.

Gaging stations have been established at Jackson on the Pearl river; at Columbus on the Tombigbee river and at Yazoo City on the Yazoo river.

Yazoo River.

The highest water recorded for the Yazoo City station was in 1882 when the height recorded by the gage was 36.5 feet which is 11.5 feet above the danger line. In October 1896, the water reached its lowest point, the gage reading–2.8 feet.

The maximum discharge of the river for 1901 was 17,300 cubic feet per second; the mean, 8,255, and the minimum, 1,965. For 1902 the maximum discharge was 25,600 cubic feet per second; the mean, 8,619; the minimum, 1,810. For 1903, the maximum was 27,700; the mean, 11,068; the minimum, 1,730.

In 1901 the maximum gage height of 23 feet was reached on April 30th. The minimum of .1 foot occurred on several days of September and October. For 1901 the maximum was 18.3; the minimum was –1.8 feet. For 1902 the maximum was 26.60 feet; the minimum was–2.10 feet. For 1903 the maximum was 28.70 feet; the minimum was–2.5 feet.

*(*Water Powers of Alabama Hall, U. S. G. S.*, 1904.)

In 1901 the minimum net horse-power per foot of fall, with a turbine efficiency of 80 per cent. was 170 horse power in November and 1,382 horse-power in February. In 1902, 164, in October and November; and 2,073 in April. In 1903, 157 in November; and 2,100 in March.

Pearl River.

A gaging station was established on the Pearl river at Jackson in 1901. For the year 1903 the maximum discharge of the river was 23,895 the mean, 3,782; the minimum, 98 cubic feet per second.

The minimum net horse-power per foot of fall was 735 in March and 9 in October, November and December.

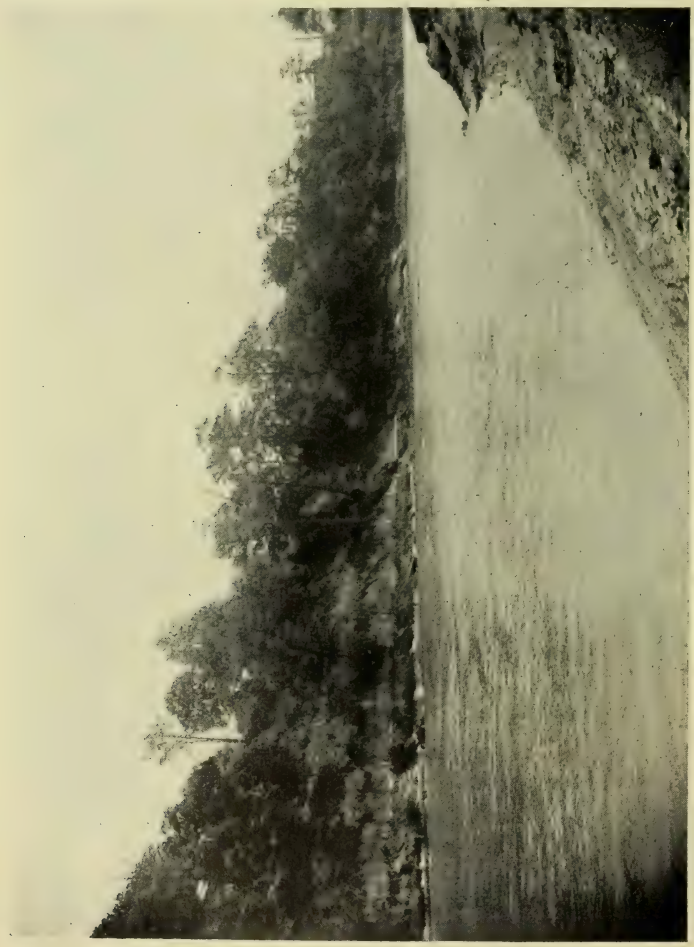

FIG. 2.—THE TOMBIGBEE RIVER AT COLUMBUS, MISS., showing an outcrop of Tombigbee sand on the farther bank.

Tombigbee River.

There is a gaging station on the Tombigbee river at Columbus.

The highest water recorded by this station was for April of 1892 when the height was 42 feet or 9 feet above the danger line. The lowest water was on October 26th, 1893, when the gage read –3.9.

On March 11th, 1901, the discharge of the river was 19,425, and on October 30th, 657 cubic feet per second. In 1902, April 3rd, 45,214, and September 26th, 493 cubic feet per second. In 1903, March 12th, 29,015 and September 22nd, 252 cubic feet per second.

Other Measurements.

The discharge of the Sakatonchee River at Mhoon Valley on August 15, 1901, was 559 cubic feet per second; the Tombigbee River at Waverly, August 16th, 6,726 cubic feet; the Yallobusha River at Grenada, May 7th, 1,336 cubic feet; the Big Black River at Goodman, April 15th, 614; at Morey, July 14th, 1903, 491, and at Way, July 15th, 1,397 cubic feet per second.

THE GEOLOGICAL POSITION OF THE WATER-BEARING STRATA OF MISSISSIPPI.

The following table gives the principal geological formations of the state which contain water-bearing strata. The exact geological position of some of the water-bearing strata of the state is not definitely known and further study will probably cause a revision of this table both in respect to the position of certain geological divisions, and also in respect to the location of certain water-bearing strata. Some of the formations not mentioned in this table as water-bearing are so, locally, and shallow sipe wells are of frequent occurrence in regions occupied by their strata.

WATER-BEARING FORMATIONS OF MISSISSIPPI.

A table showing geological formations containing the principal water-bearing strata:

Eras.	Periods.	Epochs.	Stages.
Cenozoic	Quaternary	Recent	Mississippi Bottoms.
			Surficial Coast deposits.
		Pleistocene	Brown and Yellow Loams.
			Bluff formation.
			Coastal Sub-formation. Water-bearing.
	Tertiary	Pliocene	Lafayette.—Water-bearing.
		Miocene	Grand Gulf.—Water-bearing.
		Oligiocene	Vicksburg.
		Eocene	Jackson.
			Claiborne.—Water-bearing.
			Buhrstone.—Water-bearing.
			Lignitic: Lagrange.—Water-bearing.
			Lignitic: Flatwoods.
Mesozoic	—Cretaceous		Ripley.—Water-bearing.
			Selma Chalk.
			Tombigbee.—Water-bearing
			Eutaw.—Water-bearing.
			Tuscaloosa.—Water-bearing.
Paleozoic	—Sub-Carboniferous.		

The Chemical Properties of Mississippi Underground Waters. List of Chemical Elements Usually Found in Mineral Waters.

1. Aluminum	6. Calcium	11. Lithium	16. Phosphorus
2. Ammonium	7. Carbon	12 Magnesium	17. Silica
3. Barium	8. Chlorine	13. Manganese	18. Sodium
4. Boron	9. Iodine	14. Nitrogen	19. Strontium
5. Bromine	10. Iron	15. Potassium	20. Sulphur

Chemical Elements in Mississippi Underground Waters.—The most abundant chemical elements in the underground waters of Mississippi are: Chlorine, sodium, carbon, calcium, magnesium, potassium, iron, sulphur, silica, and phosphorus.

The following classification of the underground waters of Mississippi is based upon the chemical composition of the waters and follows a method of classification suggested by Bailey.*

*(*See Mineral Waters of Kansas, pp*; 98-99.)

Classification of Mississippi Underground Waters.

1. MISSISSIPPI BOTTOMS.—The water from this region is on the whole carbonate. Sodium carbonate predominating.

2. TOMBIGBEE BASIN.—The waters of this basin belong to the soft water group. The amount of solid matter usually falls below ten grains per gallon.

3. THE NORTHEAST PRAIRIE REGION.—These waters are chlor-carbonate. There is a predominance of sodium carbonate and sodium chloride.

4. THE CHICKASAWHAY BASIN.—The waters of this basin are carbonate waters.

5. THE GULF COAST.—The waters of the Gulf Coast are chlor-carbonate. Sodium chloride is the predominant mineral.

6. OTHER PARTS OF THE STATE.—The waters from other parts of the state may be classed in general as soft.

Soft Water Group.

The waters from the following places belong to this group: Canton, Hickory, Greenwood, Batesville, Sardis, Senatobia, Lexington, Tunica, Leflore, Ackerman, Holly Springs, Water Valley, Riverside, Tupelo, Amory, Aberdeen, West Point (600-foot), Columbus, Cliftonville, Gulfport, and Biloxi.

Carbonate Group.

The waters from the following wells may be classed as carbonate: Taylorsville, Ittabena, Cleveland, Yazoo City, Leland, Glendora, Durant, Tchula, Moorehead, Indianola, Ruleville, Doddsville, Sunflower, Dockery, Clarksdale, Artesia, Enterprise, Quitman, Shubuta.

Chlor-Carbonate Group.

To this group belong the waters from the following wells: Crawford, Starkville, Agricultural College, West Point (300-foot), Muldrow, Osborn, Macon, Ocean Springs, Scranton, Moss Point, Pass Christian, Lyon, Greenville, and Jackson (chlor-sulfo- carbonate group).

THE PURITY OF UNDERGROUND WATERS.

The impurities of underground waters may be classed as organic and inorganic. Deep underground waters usually contain inorganic or mineral impurities only. It is possible, however, in the case of waters

flowing through beds of rock containing large quantities of organic matter that some of those substances will be found in it. Such conditions exist in some of the Quarternary deposits of the Gulf coast and in some of the deep wells of the Mississippi Bottoms. Most of the water, in the shallow wells of the Mississippi Bottoms, also contains much organic matter.

The mineral impurities of underground waters are derived from the rocks with which the water comes in contact in its subterranean flow.

Factors Affecting the Purity of Underground Waters.

The purity of underground waters depends upon a number of conditions:

1. Upon the mineral composition of the rocks through which the water must percolate in reaching the water-bearing stratum. Rocks containing minerals of ready solubility will contribute mineral impurities even to cold waters.

2. The purity will depend upon the mineral composition of the water-bearing stratum. For instance, marl will contribute more calcium and magnesium salts than sand.

3. The purity of underground water depends upon the rate of flow of the water in the water-bearing stratum. The rate of flow in turn depends upon the dip of the stream. Water flowing sluggishly through rocks containing organic matter will contain more impurities than the same water passing more rapidly through the same beds.

4. The purity of underground water will also be affected by the amount of humus in the soil through which the water passes on its way to the underground stratum. The presence of the humus will increase the solvent power of the water.

There can be no exact figures stated as to the amount of organic matter permissable in a potable water. In streams, shallow wells, or other surface sources of supply the presence of .10 parts albuminoid ammonia per million parts of water is looked upon with suspicion, while .15 parts per million is deemed, by experts, sufficient to condemn the water for drinking purposes. Organic matter as it is usually found in potable waters with the albuminoid ammonia it contains is not necessarily harmful, and only becomes so in its decomposition

through the agency of bacterial growth. The presence of any trace of nitrites, with considerable quantities of nitrates or free ammonia is conclusive evidence that decomposition is in progress.

Water from deep underground strata, containing organic matter which is derived from vegetable sources with little likelihood of its being infested with objectionable germ growth, can be used with safety for domestic purposes, when fresh, although the presence of albuminoid ammonia and the discoloration of the water may indicate that the water contains an abnormal quantity of organic matter.

Such waters, by standing in open containers, become suitable culture media for bacteria and are thus rendered unsafe as a source of water supply. They are, therefore, never above suspicion.

THE PRINCIPAL ARTESIAN AREAS OF MISSISSIPPI.

For convenience of discussion the principal artesian areas of Mississippi are designated under the following headings:

1. The Northeastern Deep Well Area including the Tombigbee Artesian Basin.

2. The Eastern Deep Well Area including the Chickasawhay and Leaf River Artesian Basins.

3. The Southern Deep Well Area including the Gulf Coast and Lower Pearl River Artesian Basins.

4. The Northwestern Deep Well Area including the Mississippi Bottoms and Upper Pearl River Artesian Basins.

The maps accompanying the discussions of the areas are intended to represent not only the known but also the probable artesian basins. When the underground water resources of the state are more fully developed the present limits of the artesian basins will be greatly extended.

Reference to the well statistics included in this report will enable an inhabitant of almost any part of these areas to make an approximate estimate, at least, of the depth at which he can obtain artesian water. They will, also, in many instances, give him information in regard to the strength of the flow and the quality of the water. However, no attempt has been made to give a complete list of all of the deep wells of each area but only a number sufficient to furnish the information mentioned above.

THE DEEP WELL AREA OF NORTHEASTERN MISSISSIPPI.

Including the Tombigbee Artesian Basin.

The area included under this heading comprises that portion of the state known as the northeastern prairie belt and the territory lying adjacent on the east.

The region presents three rather distinct types of topography. The first, a slightly rolling yet, taken as a whole, a comparatively level plain, the prairie. In its northern portion it reaches an elevation of about five hundred feet above sea level and gradually descends to a height of two hundred feet in its extreme southern portion. The total length of the plain is about one hundred and fifty miles. In width it rarely exceeds twenty-five miles. It is not crossed by any large streams but many small ones have dissected its surface so that areas of grass-covered land are separated by belts of valley timber.

The second type of topography is represented by the valley of the Tombigbee, and the third by the hill land lying between theTombigbee and its tributaries, and the Tennessee river. The last is a very rugged type of topography as compared with the first.

Drainage.—The entire area is drained for the most part by the Tombigbee and its tributaries. But a portion of the northeastern part is drained by the Tennesse river and its tributaries.

Geology.—The northeastern portion has for its sub-formationthe Sub-Carboniferous. The formation consists of limestones, shales, cherts, and sandstones. It is concealed by the more surficial deposits of Lafayette and Columbia. On the south and west the Sub-Carboniferous is succeeded by Cretaceous strata. The first division of the latter is the Tuscaloosa (Potomac). This formation consists of gravels, sands and clays and is strongly water-bearing. The next division is the Eutaw which consists of beds of clay, sand and lignite and is water-bearing.

The Tombigbee which overlies the Eutaw is composed largely of sand and is one of the best water-bearing formations of the region.

The Selma chalk is the next formation. The outcrop of this formation is more extensive than the others by reason of the hardness of its material as compared with the hardness of the under-lying and over-lying beds. The Selma contains some transitional beds in its lower and upper parts that are water bearing. The major part of the formation is non-water-bearing.

The Ripley formation which overlies the Selma in the northern part of the region is water-bearing.

All of these formations with the exception of the Selma chalk are largely concealed by deposits of Lafayette and Columbia (Yellow loam).

The former is the source of much of the spring and shallow well water. On the Selma outcrop, deposits of Lafayette are somewhat rare. The Yellow loam, however, is better represented, though there are many areas of black prairie soil resting on the Selma.

In nearly all of the well records of the Selma chalk area the drillers report thin strata of hard rock. These vary in thickness from one to fifteen inches. Doubtless many of these hard rocks are nodular masses of iron pyrites or pyritiferous clay stone which abound in some horizons of the Selma. Nearly all drillers report a thin layer or two of hard rock just above the water-bearing stratum. These layers of hard rock are doubtless produced by cementation. The underground water carrying minerals in solution coming in contact with the impervious layer deposits a part of its mineral content and thus cements together the particles of that layer.

Section from Starkville to Aberdeen.

This section is across the Selma chalk outcrop in a northeast-southwest direction. The Aberdeen wells are located in a water-bearing stratum which lies about 450 feet lower than the lower-most Selma which outcrops in the ridge west of Aberdeen. Toward the southwest the Selma becomes thicker, reaching a thickness of about 300 feet at West Point, and about 800 feet at Starkville.

At West Point there are two water-bearing strata. The first occurs at a depth of 300 feet, the second at 600 feet. The former is doubtless the one which supplies the water of the Muldrow, Osborn and Starkville wells. The waters from these wells have similar chemical compositions. The waters all belong to the chlor-carbonate group. The amount of solid matter varies from 36 to 59 grains per gallon. The most abundant minerals are sodium carbonate and sodium chloride.

The water from the 600-foot stratum at West Point corresponds in chemical composition to the water from the Aberdeen wells. Both belong to the soft water group. They both contain less than nine grains of solid matter per gallon. If these waters are from the same stratum, as seems very probable, the dip of the stratum from Aberdeen to West Point is about 17 feet per mile.

A section from Mayhew to Starkville shows an east and west dip of about 25 feet per mile for the water-bearing stratum. There is an increase in the thickness of the Selma chalk of about 500 feet between these two points.

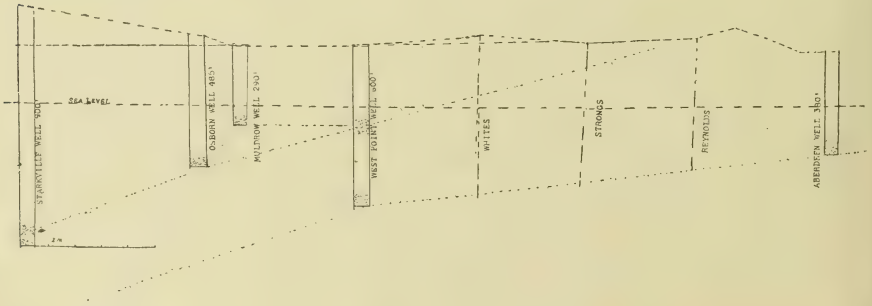

FIG. 3.—SECTION FROM STARKVILLE TO ABERDEEN, showing depth of water-bearing strata.

FIG. 4.—SECTION FROM CORINTH TO SHUQUALAK, showing the depth of wells and the thickness of the Selma chalk. Vertical scale: 1 inch=400 feet.

Section from Corinth to Shuqualak.

This section is taken through the central part of the Prairie belt and the Selma out-crop. It shows very clearly the increase in thickness of the Selma chalk from north to south. At Corinth the Selma has a thickness of from 60 to 75 feet and at Shuqualak the thickness is 750 feet. These two points occupy about the same position relative to the western border of the out-crop. The apparent irregularity in the rate of thickening is due to the difference in altitude and position of the wells in regard to the borders of the out-crop.

THE EASTERN DEEP WELL AREA INCLUDING THE CHICKASAWHAY AND LEAF RIVER ARTESIAN BASINS.

This area includes portions of the counties of Newton, Lauderdale, Clarke, Wayne, Scott, Smith, Jasper, Jones and Perry.

The sub-formations of the area are the Burhstone, the Claiborne, Jackson, the Vicksburg and the Grand Gulf.

The principal water-bearing strata belong to the first two, and the last named formations. The hill country bordering the river valleys in this area is mantled with deposits of Lafayette and Columbia. And many beautiful springs of pure water have their origin in the arenaceous strata of the former.

Flowing water is usually available for the valleys of the region, only, but for nearly all points there is an available supply of deep well water.

The artesian waters of the Chickasawhay basin belong to the carbonate group of waters. They are not strongly charged with carbonates, however, since the maximum amount of carbonate in any of the waters analyzed is only 47.9547 grains per gallon, and the maximum amount of solid matter only 57.731 grains per gallon.

Section from Enterprise to Waynesboro.

This section includes wells at Enterprise, Quitman, Shubuta and Waynesboro. The dotted line connecting the water-bearing levels in the wells will serve to indicate the depth at which artesian water may be found for places between these two points. The apparent irregularity in the dip of the water-bearing stratum is due to the difference in the position of the well with regard to the borders of the out-crop.

FIG. 5.—SECTION FROM ENTERPRISE TO WAYNESBORO, showing depth of water-bearing strata.

THE UNDERGROUND WATERS OF THE GULF COAST OF MISSISSIPPI.

The geological formations of this region belong to the Quaternary Period. They consist of fresh and brackish water sands, clays, and gravel, and marine sands and muds. There is also much intercalated vegetable matter such as the trunks and stumps of trees. The thickness of the Quaternary strata at Moss Point is about 1550 ft. as appears from a well section furnished by Mr. Suter. The well is located about four miles north of Moss Point. It was drilled the entire depth, mentioned above, in the muds and sands of the Quaternary. Wood was brought up from a depth of 1500 feet.

Water-bearing sands and gravels occur at a number of horizons of these formations. At Slidell, La., there are three water-bearing strata. The first is at a depth of 300 feet. The water flows at the rate of ten gallons per minute. The second occurs at 450 feet, and the water flows 60 gallons per minute. The third is 900 feet below the surface and the water flows 80 gallons per minute. At Bay St. Louis and at Lyman there are two water-bearing strata. Also at Moss Point and at Biloxi two water-bearing strata are encountered in the deep wells.

The water-bearing strata of the coast extend outward underneath the waters of the Mississippi Sound toward the deep waters of the Gulf. At Gulfport and at Bay St. Louis potable artesian water is obtained from strata underlying the marine waters of the Sound. At Ship Island which lies about eleven miles out in the Sound south of Biloxi artesian water is obtained at a depth of 730 feet. At Biloxi the first important water-bearing stratum is found at a depth of about 500 feet. If this is the same stratum from which the water is obtained on Ship Island the dip of the stratum seaward is about 21 feet per mile.

Section from Lacy, Miss., to Slidell, La.

This section passes from the high lands on the east of Pearl river across the valley of that river to the low coastal plain which surrounds Lake Ponchatrain. At Lacy a water-bearing stratum was found at a depth of 500 feet. The water rose within 12 feet of the surface. What is probably tbe same stratum is reached at Picayune at about the same depth and at Slidell at 900 feet. At Nicholson a water-bearing stratum occurs at 225 feet. What appears to be the same stratum is reached at a depth of 350 feet at Pearl River, and at Slidell at a depth of 450 feet.

A third stratum occurs in the Slidell well at 300 feet.

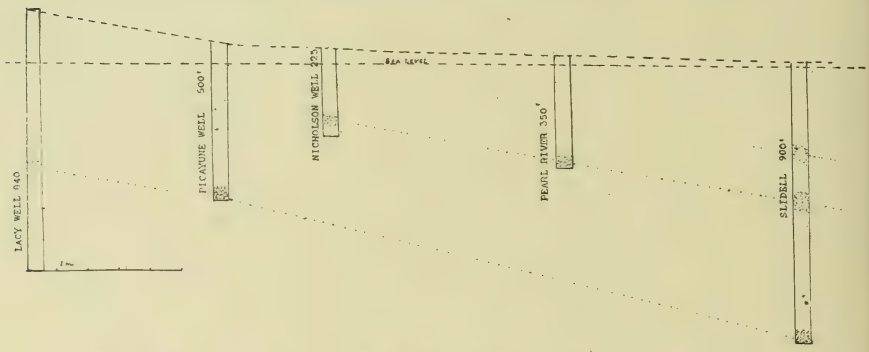

FIG 6—SECTION FROM LACY, MISS., TO SLIDELL, LA., showing position of water-bearing strata.

THE UNDERGROUND WATERS OF THE MISSISSIPPI BOTTOMS.

Including the Adjacent Hill Country.

The surface formations of the Mississippi Bottoms is alluvium of recent origin. This alluvium is deposited across the out-crop of a number of sub-formations. The upper part of the Bottoms has the Lagrange for its sub-formation. In this division of the Eocene there are several good water-bearing strata.

The Buhrstone occupies the central area of the Bottoms. This formation also contains water-bearing strata. The southern part of the Bottoms is occupied by the Jackson and Vicksburg sub-formations.

The artesian wells of this region vary in depth from 90 to 1320 feet. In some localities as many as three water-bearing strata are encountered in the wells. At Clarksdale water is obtained at 90, at 330, and at 900 feet. It is probable that it is the 330-foot stratum

which supplies the wells at Dockery and at Indianola. If so, the dip of the rocks toward the south is about sixteen feet per mile.

The lines marking the boundaries of the sub-formations do not cross the Bottoms in an east and west direction but in a general northwest to southeast direction probably curving more and more toward the west as they approach the river. This fact will doubtless account for the apparent depression formed at Indianola as exhibited in the section from Greenwood to Greenville. It is probable also that the water-bearing stratum at Leland and Greenville is from a higher formation.

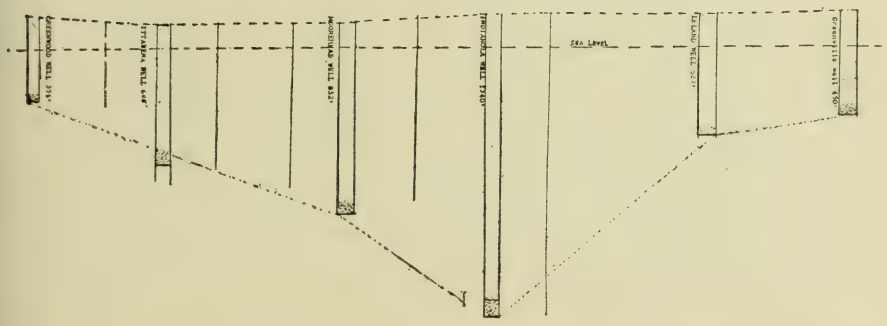

FIG. 7.—SECTION, SHOWING DEPTH OF WELLS between Greenwood and Greenville, Miss.

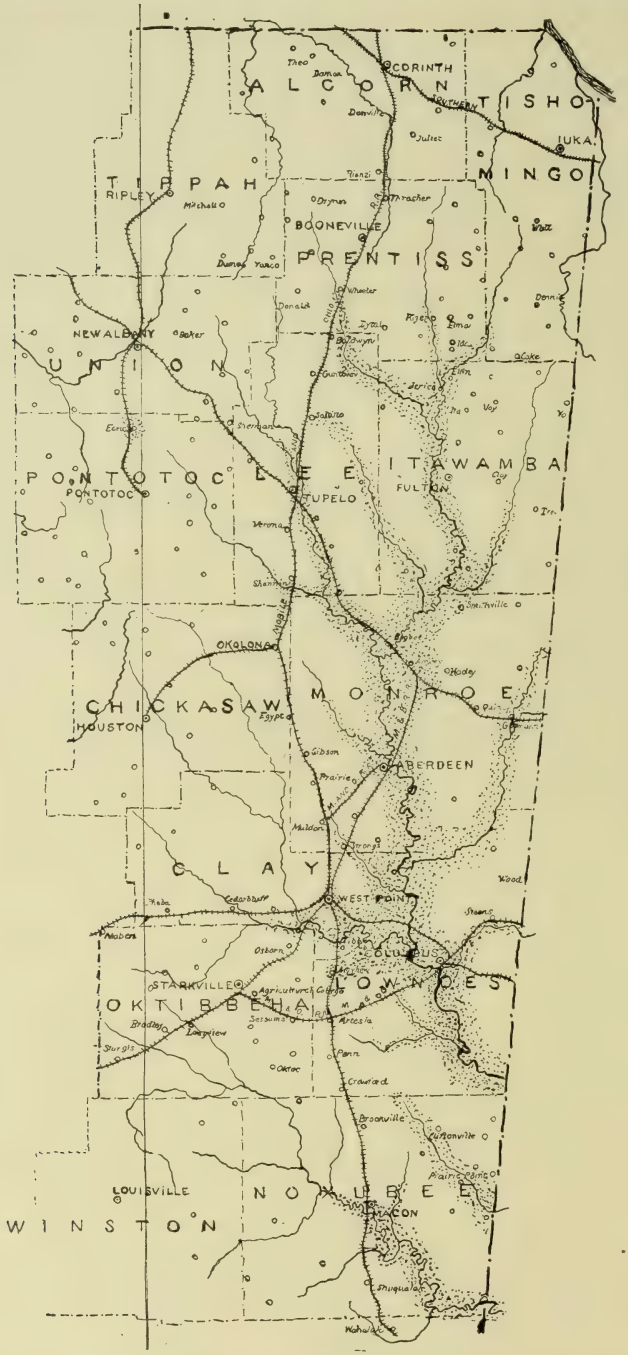

FIG. 8.—MAP OF THE NORTHEASTERN DEEP WELL AREA, including the Tombigbee Artesian Basin. Shaded portion represents the known and probable artesian areas; unshaded portion, an area of deep non-flowing wells, for most part.

TISHOMINGO COUNTY.

Iuka.

IUKA WELLS.—The depth of the wells varies with the thickness of the Lafayette formation at the base of which the water is found; the thickness of the formation varies from 20 to 90 feet.

IUKA SPRINGS.—Mineral springs occur along the line of contact of the Lafayette sands and the Potomac clays at Iuka. There are about twelve of these mineral springs in the town, six of them being located in the park.

FIG. 9.—THE IUKA SPRINGS.

FIG. 10.—SECTION SHOWING THE GEOLOGICAL CONDITIONS UNDER WHICH THE IUKA SPRINGS OCCUR.

ALCORN COUNTY.

J. W. TAYLOR WELL.—Depth, 500 feet; water found in gravel (Tuscaloosa); a good supply of potable water but it does not flow.

SECTION OF TAYLOR WELL.

	THICKNESS.	DEPTH.
Soil, sand and clay	20 feet	20 feet.

	THICKNESS.	DEPTH.
Limestone (Selma chalk)	57 feet	77 feet.
Hard rock and sand	11 feet	88 feet.
Sand, water and clay	392 feet	480 feet.
Water-bearing sand and gravel	20 feet	500 feet.

RUSSELL WELL.—Depth, 87 feet; water rises within 50 feet of the surface; mouth of the well about 441 feet above sea level.

SECTION OF THE RUSSELL WELL.

	THICKNESS.	DEPTH.
Soil, sand and clay	18 feet	18 feet.
Limestone (Selma)	57 feet	75 feet.
Hard rock	1 foot	76 feet.
Sand	10 feet	86 feet.
Hard rock	.8 foot	86.8 feet.
Water-bearing sand	3 feet	89.8 feet.

LEE COUNTY.

Baldwyn.

COTTON OIL MILL WELL.—Depth, 400 feet; water rises within 30 feet of surface; mouth of well about 348 feet above sea level; water abundant and potable.

BRICK AND TILE CO., WELL NO. 1.—Depth, 368 feet; water rises to 8 feet of surface; mouth of well about 328 feet above sea level.

BRICK AND TILE CO. WELL NO. 2.—Depth, 380 feet; water within five feet of surface; mouth of well about 325 feet above sea level.

SECTION OF WELL NO. 2.

	THICKNESS.	DEPTH.
Soil, clay and sand (Columbia)	40 feet	40 feet.
Limestone (Selma chalk)	74 feet	114 feet.
Clay and sand (Tombigbee)	220 feet	334 feet.
Water-bearing sand	46 feet	380 feet.

A well one half mile east of Baldwyn has a depth of 400 feet; water flows 20 gallons per minute; the mouth of the well is lower than any of the above named wells.

BALDWYN MINERAL SPRING.—Location, just south of the railroad station; water contains sulphur and iron; spring formed at line of contact between the Lafayette and the Selma.

ANALYSIS OF WATER FROM BALDWYN SPRING.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.026
Iron oxide	.495
Lime	.274
Magnesia	.133
Sulphur trioxide	.378
Potash	.324
Soda	.324
Chlorine	.145
Carbon dioxide	.444
Total solid matter	3.543
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.599
Sodium chloride	.239
Sodium sulphate	.183
Sodium carbonate	.201
Calcium carbonate	.489
Magnesium carbonate	.279

Guntown.

GUNTOWN WELL.—Depth, 300 feet; water rises to 30 feet of the surface; mouth of the well about 358 feet above sea level. The depth reported for this well does not accord with the depths reported for the Baldwyn and Saltillo wells. Guntown is on slightly higher ground than the two stations named and about the same relative position with regard to the boundaries of the Selma out-crop. The water-bearing stratum should be found at a greater depth at Guntown.

Saltillo.

Saltillo has four deep wells; depth about 350 feet; those on low ground flow; mouth of the wells about 315 feet above sea level.

Two miles southwest of Saltillo there are some flowing wells. These have a depth of about 300 feet. The wells are in a creek valley and their mouths are lower than the wells at Saltillo.

Leighton.

Wells at Leighton are said to have a depth of 150 feet and the water to rise to within 50 feet of the surface.

Tupelo.

M. & O. R. R. WELL.—Depth, 436 feet; flows a small stream; mouth of well about 280 feet above sea level.

FIG. 11.—AN ARTESIAN WELL AT TUPELO, MISS.

SECTION OF RAILROAD WELL.

	THICKNESS.	DEPTH.
Sand and gravel	15 feet	15 feet.
Blue limestone (Selma chalk)	200 feet	215 feet.
Hard rock	1 foot	216 feet.
Soft rock	150 feet	366 feet.
Green sand, soapstone and water	40 feet	406 feet.
Soapstone (clay)	30 feet	436 feet.

ANALYSIS OF WATER FROM RAILROAD WELL.

SUBSTANCE	GRAINS PER GALLON
Silica	.5830
Oxide of Fe and Al	.0058
Lime	1.2126
Magnesia	.2875
Sulphur trioxide	.2839
Potash	.3341
Soda	3.0378
Chlorine	4.0590
Carbon dioxide	.9026
Total solid matter	10.7074
Sulphuric acid, chlorine, and carbon dioxide combined as—	

Potassium sulphate	.6180
Sodium chloride	5.7226
Magnesium chloride	.6785
Calcium chloride	.1273
Calcium carbonate	2.0510

WATER WORKS WELL.—Depth, 300 feet; water 8 feet of surface; mouth of well about 280 feet above sea level.

SECTION OF WATER WORKS WELL.

	THICKNESS.	DEPTH.
Surface loam	25 feet	25 feet.
Blue Marl (Selma chalk)	75 feet	100 feet.
Hard rock and shells	10 feet	110 feet.
Blue rock	20 feet	130 feet.
Blue rock, harder	45 feet	175 feet.
Blue micaceous sand	5 feet	180 feet.
Hard rock (iron pyrites)	1 foot	181 feet.
Blue micaceous marl	10 feet	191 feet.
Hard rock	1 foot	192 feet.
Sand and water-bearing sand	108 feet	300 feet.

BRICK YARD WELL.—Depth, 325 feet; water 8 feet of surface; cistern pump used to elevate water.

WELL THREE BLOCKS EAST OF BRICK YARD.—Depth, 300 feet; water flowing 25 gallons per minute; mouth of well lower than those named above.

FIG. 12.—PARK LAKE AT TUPELO, MISS. Supplied with water from five artesian wells.

Park Lake north of Tupelo is supplied with water from five flowing wells. The fish hatchery south of town derives its water supply from flowing wells. There are two wells at the Cotton Mill and a number of other wells in the town all of which have a depth of about 300 feet.

One well in the public street flowed for a time but now the water stands within six feet of the surface. The decrease in pressure head of this well has been attributed to the drilling of other wells in the immediate neighborhood. It is probable, however, that it is due to the partial closing of the well. The partial closing of the well may have been accidentally coincident with the drilling of other wells.

Along the creek valley east and northeast of Tupelo flowing water may be obtained at a depth of about 300 feet. Flowing wells are located two miles and five miles southeast of Tupelo.

On the low chalk hills, two and one half miles southwest of Tupelo deep wells reach water-bearing strata at 400 feet; the water does not flow.

Near Coonewar, about ten miles west of Tupelo, wells have a depth of 650 feet; the water rises within 100 feet of the surface.

Mooresville.

MOORESVILLE WELL.—Depth, 200 feet; water not flowing.

Verona.

VERONA WELLS.—Depth 400 feet; mouth of wells about 315 feet above sea level. Water rises to 50 feet of surface.

JAMES BUNCH WELL.—Depth, 448 feet; cost of drilling, $174; date of drilling, 1852.

Shannon.

SHANNON WELLS.—Depth, 325 feet; mouth of wells about 247 feet above sea level; those on low ground are flowing wells.

Nettleton.

NETTLETON WELLS.—Depth, 400 feet; water flowing; month of wells about 300 feet above sea level.

CHICKASAW COUNTY.

Okolona.

M. & O. R. R. WELL.—Depth, 548 feet; mouth of well about 310 feet above sea level; water rises within 22 feet of surface.

SECTION OF OKOLONA WELL.

	THICKNESS.	DEPTH.
Soil, gravel and clay	20 feet	20 feet.
Blue limestone (Selma chalk)	300 feet	320 feet.
Hard sand rock	3 feet	323 feet.
Sand rock	100 feet	423 feet.
Green sand, soapstone and water	50 feet	473 feet.
Soapstone	75 feet	548 feet.

Other wells having a depth of 450 feet are reported for Okolona.

AKIN WELL.—Reported by Ladd as being 25 miles west of Aberdeen which would bring it about the southeast corner of Chickasaw county; depth, 436 feet; flows a small stream.

SECTION OF AKIN WELL.

	THICKNESS.	DEPTH.
Clay	10 feet	10 feet.
Limestone (Selma chalk)	200 feet	210 feet.
Hard Sandstone	1 foot	211 feet.
Soft sandstone	100 feet	311 feet.
Green sand and soapstone (clay)	50 feet	361 feet.
Soapstone (clay)	50 feet	411 feet.

MONROE COUNTY.

Smithville.

VILLAGE WELL.—Depth, 120 feet; flowing water. A flowing well is located two miles north of Smithville.

STOCKTON WELL.—Location, four and one half miles north of Amory; depth, 156 feet; flowing water.

SECTION OF STOCKTON WELL.

	THICKNESS.	DEPTH.
Surface loam and gravel	16 feet	16 feet.
Blue sand and clay	130 feet	146 feet.
Sand and gravel	10 feet	156 feet.

Flowing wells are located at the following points along the Smithville-Amory road: One fourth mile; one half mile; one mile; three and three fourths miles; four miles; four and one fourth miles; four and one half miles; five miles; five and one fourth miles; five and one half, and six miles north of Amory.

Bigbee.

BIGBEE WELLS.—Two wells; about 160 feet in depth,; both wells flowing. One mile north of Bigbee there is a flowing well.

Amory.

There are about 60 flowing wells in Amory. There are eight public wells. The average depth is 200 feet.

GENERAL SECTION OF AMORY WELLS.

	THICKNESS.	DEPTH.
Surface loam	15 feet	15 feet.
Gravel and water	25 feet	40 feet.
Blue sand	100 feet	140 feet.
Sand and water	50 feet	190 feet.

ANALYSIS OF WATER FROM AMORY WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.4897
Oxides of Fe and Al (Iron and Aluminum)	.6471
Lime	.3031
Magnesia	.1805
Sulphur trioxide	.1739
Potash	.2990
Soda	.5606
Chlorine	.2460
Carbon dioxide	.7257
Total solid matter	3.6256
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.3786
Potassium chloride	.1492
Sodium carbonate	.6965
Sodium chloride	.2887
Calcium carbonate	.5413
Magnesium carbonate	.3790

ROUND HOUSE WELLS.—Two wells, depth, 190 feet; flow about 125 gallons per minute. Another well, depth, 250 feet; flows about200 gallons per minute.

SECTION OF 250-FOOT WELL.

	THICKNESS.	DEPTH.
Surface sand	15 feet	15 feet.
Gravel	25 feet	40 feet.
Blue sand	100 feet	140 feet.
Sand and water	50 feet	190 feet.
Blue clay and sand	50 feet	240 feet.
Gravel	10 feet	250 feet.

Gatman.

GATMAN WELL.—Depth, 700 feet; water flowing. East of Gatman about six miles; wells have a depth of 300 feet and flow from 40 to 70 gallons per minute.

Cotton Gin Port.

There are two wells 300 feet in depth; both have a strong flow. These wells are located on the flood plain of the Tombigbee river. On the opposite side of the river are some steep bluffs of Tombigbee sand capped with Selma chalk.

In the Tombigbee valley of this region flowing wells are obtained, one-half mile east, two miles west, two and one-half miles southwest, three and one-half miles southwest and four miles south of Amory. Flowing water is obtained at 200 feet in the last named locality

Aberdeen.

There are about twenty-five deep wells in Aberdeen. There are five public wells. Wells in the higher part of the town have a depth of about 400 feet. The depth of the wells in the river valley is about 380 feet.

GENERAL SECTION OF VALLEY WELLS.

	THICKNESS.	DEPTH.
Surface soil and loam	15 feet	15 feet.
Sandstone	200 feet	215 feet.
Sand and first water	35 feet	250 feet.
Clay and lignite	100 feet	350 feet.
Sand and water	30 feet	380 feet.

ANALYSIS OF WATER FROM ABERDEEN WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.6937
Oxide of Fe. and Al.	1.0490
Lime	.5130
Magnesia	.2308
Sulphur trioxide	.0874
Poatsh	.4197
Soda	.9484
Chlorine	.3567
Carbon dioxide	1.2561
Total solid matter	5.6107
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1902
Potassium chloride	.5013
Sodium chloride	.1952
Sodium carbonate	1.4451
Calcium carbonate	.9162
Magnesium carbonate	.4846

COMPRESS WELL.—Depth, 450 feet; water flows 160 gallons per minute; mouth of well about 200 feet above sea level.

SECTION OF COMPRESS WELL.

	THICKNESS.	DEPTH.
Clay and sand	25 feet	25 feet.
Sand rock hard in places	300 feet	325 feet.
Sand rock, clay and water	125 feet	450 feet.

RAILROAD WELL.—Depth, 400 feet; water overflowing 90 gallons per minute; mouth of well about 200 feet above sea level.

East of Aberdeen about five miles there is a flowing well which has a depth of 300 feet.

North of Aberdeen, four and five and one-half miles, flowing wells are obtained.

South of Aberdeen two miles there are two flowing wells.

West of Aberdeen eight miles there is a well which has a depth of 418 feet and the water rises within 66 feet of the surface. The following is a general section of the wells in this neighborhood:

	THICKNESS.	DEPTH.
Surface soil and clay	20 feet	20 feet.
Limestone (Selma chalk)	200 feet	220 feet.
Sandstone, sand and water	200 feet	420 feet.

Central Grove.

There are about twenty-five wells in this locality. They are said to vary in depth from 200 to 400 feet and are not flowing. One well about four miles east of Central Grove has a depth of 500 feet but is not a flowing well.

Prairie.

Wells reported as having a depth of about 350 feet; mouth of wells about 313 feet above sea level; and water within 100 feet of the surface.

Muldon.

M. & O. R. R. WELL.—Depth, 620 feet; water 83 feet of surface; mouth of well about 303 feet above sea level.

VILLAGE WELL.—Depth, 352 feet;water 82 feet of the surface; mouth of the well about 303 feet above sea level.

CLAY COUNTY.

West Point.

At West Point water-bearing strata are found at depth of 300 and 600 feet. Some well drillers assert that the stronger flow is from the 300-foot stratum. Wells on low ground flow about 5 gallons per minute.

TOWN WELL.--Depth, 600 feet; water flowed at first, does not now; mouth of well about 242 feet above sea level.

SECTION OF WEST POINT WELL.

	THICKNESS.	DEPTH.
Soil and loam	20 feet	20 feet.
Limestone (Selma chalk)	180 feet	200 feet.
Sand and clay	100 feet	300 feet.
Sand and clay	300 feet	600 feet.

ANALYSIS OF WATER FROM WEST POINT WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.5713
Oxides of Fe and Al.	.1282
Lime	.7404
Magnesia	.2098
Sulphur trioxide	.1539
Potash	.5635
Soda	2.7912
Chlorine	.3987
Carbon dioxide	2.7213
Total solid matter	8.2783
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.3350
Potassium chloride	.6032
Sodium chloride	.1845
Sodium carbonate	4.6040
Calcium carbonate	1.3219
Magnesium carbonate	.4412

ANALYSIS OF WATER FROM 368-FT. WELL, WEST POINT.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.4489
Oxides of Fe and Al.	.0583
Lime	.9328
Magnesia	.2098
Sulphur trioxide	.0599
Potash	.2023

Soda	9.5023
Chlorine	4.4130
Carbon dioxide	20.8524
Total solid matter	36.6797
Sulphuric acid, chlorine, and carbon dioxide combined as—	
Potassium sulphate	.1304
Potassium chloride	.2082
Sodium chloride	7.1096
Sodium carbonate	9.7955
Calcium carbonate	1.6654
Magnesium carbonate	.4412

Both samples of water were submitted for analysis by Mr. S. L. Hearn of West Point. The water from the first well belongs to the soft water group while the second belongs to the chlor-carbonate group.

Potability.—The water from the first well contains .04 parts per million of free ammonia and .02 parts per million of albuminoids.

The water from the second well contains .32 parts free ammonia and .01 parts albuminoids per million.

Cedar Bluffs.

VILLAGE WELL.—Depth, 650 feet; water rises within forty feet of the surface.

SECTIONS OF CEDAR BLUFFS WELL.

	THICKNESS.	DEPTH.
Soil and loam	10 feet	10 feet.
Limestone (Selma chalk)	450 feet	460 feet.
Hard rock	2 feet	462 feet.
Sand and water	188 feet	650 feet.

Phoeba.

VILLAGE WELL.—Depth, about 1000 feet and the water rises within about 100 feet of the surface.

Waverly.

There are a number of good flowing wells at Waverly and in the country about the village.

LOWNDES COUNTY.

Columbus.

M. & O. R. R. WELL.—Depth, 420 feet; water flowing 130 gallons per minute; mouth of well about 208 feet above sea level.

SECTION OF RAILROAD WELL.

	THICKNESS.	DEPTH.
Clay, sand and gravel	25 feet	25 feet.
Sandstone	300 feet	325 feet.
Green sand and clay	95 feet	420 feet.

MAIN ST. WELL.—Depth, 560 feet; water flowing; mouth of well about 240 feet above sea level.

ANALYSIS OF WATER FROM MAIN STREET WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.5490
Oxides of Fe and Al.	.8278
Lime	.8745
Magnesia	.3651
Sulphur trioxide	.0049
Potash	.4664
Soda	.6179
Chlorine	.2214
Carbon dioxide	1.6050
Total solid matter	5.5320
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.0106
Potassium chloride	.4656
Potassium carbonate	.2445
Sodium carbonate	1.0559
Calcium carbonate	1.5618
Magnesium carbonate	.7667

SAMUEL KAYE WELL.—Depth, 540 feet; flowing water; mouth of well about 240 feet above sea level.

ANALYSIS OF WATER FROM KAYE WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.6034
Oxides of Fe and Al.	.1953
Lime	.6354
Magnesia	.2539
Sulphur trioxide	.0260
Potash	.6523
Soda	.8762
Chlorine	.5166
Carbon dioxide	1.2685
Total solid matter	4.9276
Sulphuric acid, chlorine and carbon dioxide combined as—	

Potassium sulphate	.0563
Potassium chloride	.9840
Sodium chloride	.0806
Sodium carbonate	1.3244
Calcium carbonate	1.1338
Magnesium carbonate	.5332

FIG. 13.—EROSION IN THE TOMBIGBEE SANDS AT COLUMBUS, MISS.

ICE FACTORY WELL.—Depth, 475 feet; water flowing; mouth of well about 208 feet above sea level.

ANALYSIS OF WATER FROM ICE FACTORY WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.5771
Oxides of Fe and Al.	.5305
Lime	.7462
Magnesia	.3001
Sulphur trioxide	.0210
Potash	.5072
Soda	.9283
Chlorine	.2706
Carbon dioxide	1.6324
Total solid matter	5.5134
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.0457
Potassium chloride	.5691
Potassium carbonate	.1805
Sodium carbonate	1.5866
Calcium carbonate	1.3327
Magnesium carbonate	.6302

There are twelve or more wells in Columbus. The deepest is about 600 feet.

Potability.—The water from the city well contains .18 parts per million of free ammonia and .02 parts per million of albuminoids.

Kolole (Shinn) Springs.

ANALYSIS OF WATER FROM THE NORTH SPRING—SOUTH SPRING.

SUBSTANCE.	GRAINS PER GALLON.	
Silica	.3906	.5247
Chlorine	.2915	.3265
Sulphur trioxide	.2565	.1749
Phosphoric acid	.0857	.0816
Potash	.2332	.2798
Soda	.1766	.1341
Lime	.5422	.5480
Magnesia	.1924	.1865
Iron oxide	1.2651	1.3409
Carbon dioxide	1.2442	1.3015
Total solid matter	4.6780	4.8985
Hypothetically combined as—		
Potassium sulphate	.4317	.3804
Sodium chloride	.3323	.2524
Magnesia chloride	.1209	.1568
Calcium sulphate	.0986	
Calcium carbonate	.8958	.9787
Magnesium carbonate	.2952	.2571
Iron carbonate	1.8331	1.9429
Potassium chloride		.1176

There are also traces of manganese and lithium in the waters of these springs.

Artesia.

M. & O. R. R. WELL.—Depth, 597 feet; water rises to 18 feet of surface; mouth of the well about 240 feet above sea level.

SECTION OF RAILROAD WELL.

	THICKNESS.	DEPTH.
Clay	10 feet	10 feet.
Limestone (Selma chalk)	350 feet	360 feet.
Hard sandstone	2 feet	362 feet.
Soft sandstone and soapstone	175 feet	537 feet.
Clay and sand	60 feet	597 feet.

ANALYSIS OF WATER FROM RAILROAD WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.9570

Oxides of Fe and Al.	.1160
Lime	.6900
Magnesia	.1900
Sulphur trioxide	.0440
Potash	.5390
Soda	18.2180
Chlorine	.4000
Carbon dioxide	13.6578
Total solid matter	34.8118
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.0960
Potassium chloride	.7810
Sodium chloride	.0540
Sodium carbonate	31.1013
Calcium carbonate	1.2320
Magnesium carbonate	.4180

C. D. Watt Well.—Depth, 600 feet; water 20 feet of surface; mouth of well about 240 feet above sea level.

J. B. Mitchell Well.—Depth, 600 feet; water within 20 feet of surface; mouth of well about 240 feet above sea level.

F. J. Smith Well No. 1.—Location, one and one-half miles north of Artesia; depth, 500 feet; well on lower ground than Artesia and well flowing.

F. J. Smith Well No. 2.—Location, two and one-half miles south of Artesia; depth, 600 feet.

Crawford.

Crawford Well.—Depth, 700 feet; water rises within 110 feet of the surface; mouth of the well about 316 feet above sea level; 4-inch pipe.

ANALYSIS OF WATER FROM CRAWFORD WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.1020
Oxides of Fe and Al.	.1515
Lime	.8337
Magnesia	.3754
Sulphur trioxide	.6354
Potash	.7923
Soda	19.5570
Chlorine	7.9100
Carbon dioxide	9.7343
Total solid matter	41.0916.

Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	1.3836
Potassium chloride	.0697
Sodium chloride	12.9986
Sodium carbonate	21.6217
Calcium carbonate	1.4887
Magnesium carbonate	.2163

Wells nine miles east of Crawford are said to have a depth of 510 feet and the water to rise within 50 feet of the surface.

Mayhew.

There are about fifteen deep wells in the village of Mayhew. The majority of them are about 400 feet in depth and flow. The deepest well is 600 feet. It has no stronger flow than the 400-foot wells.

J. B. Fost Well.—Depth, 400 feet; water overflowing; mouth of well about 214 feet above sea level.

SECTION OF FOST WELL.

	THICKNESS.	DEPTH.
Loam and soil	15 feet	15 feet.
Limestone (Selma chalk)	160 feet	175 feet.
Sand and hard rock	160 feet	335 feet.
Hard rock, sand and water	65 feet	400 feet.

T. B. Trammel Well.—Depth, 400 feet; water 6 feet of surface; mouth of well about 220 feet above sea level.

D. A. Burgin Well.—Depth, 400 feet; water 8 feet of top; mouth of well about 220 feet above sea level.

J. W. Garth Well.—Location, one mile east of Mayhew; depth, 537 feet; water flows at a depth of 400 feet.

J. O. Banks Well.—Location, one mile east of Mayhew; depth, 500 feet; water flows at a depth of 400 feet. This well and the Garth well are on lower ground than the wells in Mayhew.

Tibbee.

Yates Well.—Depth, about 260 feet; mouth of well about 207 feet above sea level; drilled by Ladd in 1864.

OKTIBBEHA COUNTY.

Starkville.

TOWN WELL.—Depth, 900 feet; mouth of well about 362 feet above sea level; water rises within 150 feet of the surface.

SECTION OF STARKVILLE WELL.

	THICKNESS.	DEPTH.
Surface soil and clay	14 feet	14 feet.
Limestone (Selma chalk)	749 feet	763 feet.
Hard shell rock	4 feet	767 feet.
Sand and clay	24.5 feet	791.5 feet.
Shell rock	7 feet	798.5 feet.
Water-bearing sand	56 feet	854.5 feet.
Hard clay	10 feet	864.5 feet.
Water-bearing sand	35.5 feet	900 feet.

ANALYSIS OF WATER FROM STARKVILLE WELL.*

SUBSTANCE.	GRAINS PER GALLON.
Potassium sulphate	.1241
Potassium chloride	1.4082
Sodium chloride	15.7539
Sodium bicarbonate	39.2621
Calcium bicarbonate	1.2086
Magnesium bicarbonate	.9100
Iron bicarbonate	.1666
Soluble silica	.6939
Total solid matter	59.5265

It is evident from the above analysis that the artesian water of Oktibbeha county belongs to that class of waters known as the chlorocarbonate group, since the analysis demonstrates the presence of large percentages of the chlorine and carbonate ions. The waters belonging to this group have very good therapeutic properties. "In moderate quantities it (the carbonate ion) stimulates the flow of saliva, aids digestion, slightly accelerates the pulse, renders the mind clear, and the person cheerful. Bathing in water charged with carbon dioxide causes a prickling sensation, which lasts for some time, and persons in health, on leaving the bath, experience a pleasing exhilaration, and the inclination to muscular activity is greatly increased. Sodium

* *Analysis reported by Dr. W. F. Hand, State Chemist.*

chloride, when taken into the system, increases the flow of the gastric juice, bile and pancreatic juice, stimulates the appetite and assists digestion. So, for gastric, hepatic and intestinal disorders, the salt waters are useful. This is especially true where there is an insufficiency of digestive fluids, with stools, a furred tongue, and disagreeable taste in the mouth, with loss of appetite. On account of their strong diurtic action these waters may be used in cases of rheumatism, gout and scrofula. When other positive ions, as well as sodium, are present, the action of the chlorine ion is modified. This may be seen in the case of magnesium chloride which has more marked cathartic properties than has sodium chloride."*

The different artesian waters of Oktibbeha county exhibit considerable variation in the percentage of some of the salts. The Starkville water contains the highest percentage of sodium bicarbonate of any of the waters of the county thus far analyzed. The College deep-well water contains more than eight per cent. less sodium carbonate. The water from the Muldrow well contains more than eighteen per cent. less sodium carbonate than the Starkville water. By a comparison of the analyses of the waters from these wells other variations in the quantities of the chemical substances may be noted.

Agricultural College.

AGRICULTURAL AND MECHANICAL COLLEGE WELL NO. 1.—Depth, 995 feet; water rises within 155 feet of the top; mouth of the well about 390 feet above sea level; 4-inch pipe used for 950 feet; 6-inch pipe for 375 feet; capacity, 50 gallons per minute.

WELL NO. 2.—Depth, 1008 feet; static head, 175 feet; 6-inch casing; no strainer; compressed air used to elevate water; capacity, 100 gallons per minute; rotary drill used.

SECTION OF WELL NO. 2.

	THICKNESS.	DEPTH.
Clay and soil	20 feet	20 feet.
Limestone	795 feet	815 feet.
Sand and water	185 feet	1000 feet.
Hard blue clay	8 feet	1008 feet.

* *Dr. E. H. S. Bailey—K. S. U. Geol. Sur. Vol. VII, p. 62.*

ANALYSIS OF WATER FROM COLLEGE WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silicon dioxide	.198
Ferrous carbonate	.084
Magnesium carbonate	.096
Calcium carbonate	.761
Potassium sulphate	.340
Potassium chloride	.236
Sodium chloride	11.876
Sodium bicarbonate	30.915
Total solid matter	45.106

Osborn.

A. A. MONTGOMERY WELL.—Depth, 485 feet; water 30 feet of surface; mouth of well, 285 feet above sea level.

SECTION OF MONTGOMERY WELL.

	THICKNESS.	DEPTH.
Soil	2 feet	2 feet.
Limestone (Selma chalk)	350 feet	352 feet.
Sand, hard rock, and water	133 feet	485 feet.

W. W. BOYD WELL.—Depth, 500 feet; mouth of well about 285 feet above sea level.

J. E. LOVE, SR., WELL NO. 1.—Location, one half mile east of Osborn; depth, 700 feet; at a depth of 450 feet the water rose to 30 feet of surface.

J. E. LOVE, SR., WELL NO. 2.—Depth, 450 feet; water rises to five feet of surface.

J. E. LOVE, SR., WELL NO. 3.—Depth, 450 feet; water rises within four feet of the surface.

J. E. LOVE, JR., WELL NO. 1.—Depth, 505 feet; water within 40 feet of surface.

Muldrows.

J. A. SHIRLEY WELL NO. 1.—Depth, 290 feet; a three-quarter inch stream rises to a height of ten feet above the surface; mouth of the well about 227 feet above sea level.

A. B. Rush Well.—Depth, 300 feet; water rises to 8 feet of surface; mouth of the well about 227 feet above sea level.

J. A. Shirley Well No. 2.—Location, one-half mile west of Muldrows; depth 300 feet; water flows; mouth of well about 240 feet above sea level.

H. L. Muldrows Well No. 1.—Location, one-half mile east of Muldrows; depth, 300 feet; flowing water.

ANALYSIS OF WATER FROM WELL NO. 1.*

SUBSTANCE.	GRAINS PER GALLON.
Silicon dioxide	.6939
Ferrous carbonate	.1666
Magnesium carbonate	.9100
Calcium carbonate	1.2086
Potassium sulphate	.1241
Potassium chloride	1.4082
Sodium chloride	15.7530
Sodium bicarbonate	39.2621
Total solid matter	59.5265

H. L. Muldrow Well No. 2.—Location, about one half mile east of Muldrows station; depth, 300 feet; overflowing well; mouth of the well lower than 227 feet.

Dr. V. K. Chandler Wells.—Location, one mile east of Muldrows; three wells; overflowing; depth, 300 feet.

Dawson Mims Well.—Depth, 350 feet; water flowing; mouth of well about 220 feet above sea level.

Lewis Mims Well.—Depth, 300 feet; water flowing; mouth of well about 220 feet above sea level.

W. Locket Well.—Depth, 300 feet; water flowing.

Hickory Grove.

R. Daughety Well.—Depth, 520 feet; water rises within 60 feet of surface.

J. C. Rand Well.—Depth, 520 feet; water rises within 60 feet of surface.

* *Reported by Dr. W. F. Hand, State Chemist.*

F. S. Finkley Well.—Location, one mile east of Hickory Grove; depth, 500 feet; water rises within 40 feet of surface.

D. A. Burgin Well.—Location, one mile west of Hickory Grove; depth, about 500 feet; water rises within 70 feet of the surface.

J. M. McCollum Well.—Location, one and one half miles southeast of Hickory Grove; depth, 480 feet; water rises to within 30 feet of surface.

Sessumsville.

Sessums Well.—Depth, 630 feet; water flowed a small stream; mouth of well about 230 feet above sea level.

SECTION OF SESSUMS WELL.

	THICKNESS.	DEPTH.
Clay and sand	20 feet	20 feet.
Limestone (Selma chalk)	450 feet	470 feet.
Sandstone	100 feet	570 feet.
Clay, green sand and water	60 feet	630 feet.

Frye Well.—Depth, 653 feet; water about 100 feet of the surface; mouth of well about 240 feet above sea level.

SECTION OF FRYE WELL.

	THICKNESS.	DEPTH.
Limestone (Selma chalk)	450 feet	450 feet.
Hard rock and sand	20 feet	470 feet.
Thin hard rock and sand	30 feet	500 feet.
Sandstone and sand	153 feet	653 feet.

W. D. Askew Well No. 1.—Location, three-fourths of a mile north of Sessums; depth, 400 feet; first water at 300 feet; water rises within 75 feet of the surface.

W. D. Askew Well No. 2.—Depth, 400 feet; water rises within 17 feet of the surface; mouth of the well about 20 feet lower than No. 1.

J. S. Foster Well.—Depth, 600 feet; water 100 feet of the surface.

Hampton Gay Well.—Depth, 478 feet; drilled by Ladd in 1861.

Mrs. Perkins Well.—Depth, 533 feet; cost of drilling, $283.00; drilled by Ladd in 1853.

NOXUBEE COUNTY.

Brookville.

M. & O. R. R. WELL.—Depth, 682 feet; water rises within 60 feet of surface; mouth of well about 283 feet above sea level.

SECTION OF BROOKVILLE WELL.

	THICKNESS.	DEPTH.
Clay	8 feet	8 feet.
Limestone (Selma chalk)	450 feet	458 feet.
Hard sand	4 feet	462 feet.
Soft sand	150 feet	612 feet.
Green sand and water	45 feet	657 feet.

Wells from six to nine miles east of Brookville are reported to have a depth of 400 feet.

Macon.

M. & O. R. R. WELL.—Depth, 769 feet; water flows 26 gallons per minute; mouth of well about 193 feet above sea level.

SECTION OF MACON WELL.

	THICKNESS.	DEPTH.
Clay	8 feet	8 feet.
Limestone (Selma chalk)	600 feet	608 feet.
Hard sandstone	3 feet	611 feet.
Soft sandstone	65 feet	676 feet.
Green sand and water	40 feet	716 feet
Soapstone (clay)	53 feet	769 feet.

ANALYSIS OF WATER FROM MACON WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.6937
Oxides of Fe and Al.	.0493
Lime	.7520
Magnesia	.3358
Sulphur trioxide	.0890
Potash	2.2637
Soda	28.5907
Chlorine	23.3700
Carbon dioxide	7.7384
Total solid matter	63.8826

Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1937
Potassium chloride	3.4155
Sodium chloride	35.8553
Sodium carbonate	16.3383
Calcium carbonate	1.3430
Magnesium carbonate	.7051

This water was taken from the public well in the streets of Macon.

East of Macon.

WELL TWO MILES EAST OF MACON.—Depth, 602 feet; flowing water.

ANALSIS OF WATER FROM ABOVE WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.6179
Oxides of Fe and Al.	.0583
Lime	.4081
Magnesia	.2034
Sulphuric acid	.0014
Potash	.5247
Soda	25.6593
Chlorine	19.1883
Carbon dioxide	9.9015
Total solid matter	60.5629
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	0030
Potassium chloride	.8275
Sodium chloride	30.9890
Sodium carbonate	22.5789
Calcium carbonate	.7198
Magnesium carbonate	.4271

Cliftonville.

WELL LOCATED ONE MILE NORTH OF CLIFTONVILLE.—Depth, 580 feet; water flows 10 gallons per minute.

SECTION OF CLIFTONVILLE WELL.

	THICKNESS.	DEPTH.
Limestone (Selma chalk)	400 feet	400 feet.
Sand and lignite	50 feet	450 feet.
Sandstone, clay and sand	130 feet	580 feet.

ANALYSIS OF WATER FROM CLIFTONVILLE WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.7841
Oxides of Fe and Al.	.1020
Lime	.1166
Magnesia	.0262
Sulphur trioxide	.0717
Potash	.1125
Soda	5.0813
Chlorine	4.0230
Carbon dioxide	3.4856
Phosphoric acid	.0839
Total solid matter	10.2662
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1561
Potassium chloride	.0444
Sodium chloride	.6285
Sodium carbonate	8.1140
Calcium carbonate	.2082
Magnesium carbonate	.0550

Shuqualak.

SHUQUALAK WELL.—Depth, 910 feet; water rises within ten feet of the surface; water elevated by means of compressed air.

SECTION OF SHUQUALAK WELL.

	THICKNESS.	DEPTH.
Clay	10 feet	10 feet.
Limestone (Selma chalk)	750 feet	760 feet.
Sandstone	100 feet	860 feet.
Green sand and water	50 feet	910 feet.

H. W. FOOTE WELL.—Depth, 720 feet; cost, $567.50; drilled in 1859.

Other Wells in Noxubee County.

DRILLED BY LADD.

SAMUEL CONNOR WELL.—Location, 5 or 6 miles southwest of Macon; depth, 368 feet; cost of drilling, $134.25; date, 1852.

WADE SMITH WELL.—Location, 8 miles east of Macon; depth, 512 feet; cost, $206; date, 1852.

C. W. Moore Well.—Location, near New Bethel Church, about 12 miles northeast of Macon; depth, 602 feet; date 1853; sand bed at 297 feet from surface; tubing used, 88 feet of 4 3-8, 72 feet of 3 3-4, 54 feet of 3 3-8, and 36 feet of 3 1-16.

Mrs. Connor Well.—Location, 3 miles southwest of Macon; depth, 382 feet; cost, $169.20; date, 1853.

Joe Hunter Well.—Location, not given; depth, 610 feet; cost, $360.75; date, 1853.

Henry Pratt Well.—Location, 15 miles northeast of Macon; depth, 210 feet; cost, $75; date, 1854.

Nicholas Augustus Well.—Location, 3 miles south of Brooksville; depth, 699 feet; cost, $75; date, 1854.

Dr. E. Deupree Well.—Location, 5 miles east of Brookville; depth, 585 feet; date, 1854.

Thomas Paulett Well.—Location, at Paulett, 12 miles southeast of Macon; depth, 532 feet; cost, $282; date, 1854.

Mrs. Gray Well.—Location, about 15 miles east of Macon; depth 495 feet; cost, $246; date, 1854.

Minor Robinson.—Location, east of Macon; depth, 521 feet; cost, $271.50; date, 1854.

Wm. C. Brooks Well.—Location, near Brookville; depth, 559 feet; cost, $309; date, 1855.

M. Nelson Well.—Location, near Macon; depth, 572 feet; cost, $322; date, 1855.

Thomas Brooks Well.—Location, near Brookville; depth, 607 feet; cost, $357; date, 1855.

Mathew Brooks Well.—Location, near Brookville; depth, 572 feet; cost, $322; date, 1855.

Abe Connor Well.—Location, southwest of Macon; depth, 472 feet; cost, $230.50; date, 1856.

Tyre Spann.—Location, east of Macon; depth, 465 feet; cost, $225.50; date, 1857.

Edward Price Well.—Location, about 10 miles northeast of Macon; depth, 472 feet; cost, $230.40; date, 1857.

WM. DENT WELL.—Location, east of Macon; depth, 495 feet; cost, $308.13; date, 1857.

JOHN MCLEOD WELL.—Location, west of Brookville; depth, 523 feet; cost, $335; date, 1858.

THOMAS BUSH WELL.—Location, 3 miles north of Macon; depth, 425 feet; cost, $247.12; date, 1858.

GEORGE THARPE WELL.—Location, east of Brookville; depth, 374 feet; cost, $205.50; date, 1858.

WM. B. AUGUSTUS WELL.—Location, 3 miles northeast of Macon; depth, 713 feet; date, 1858.

JAMES ECKFORD WELL.—Location, 7 miles northeast of Macon; depth, 586 feet; cost, $399.34; date, 1859.

JOHN FANCHLER WELL.—Location, 15 miles southwest of Macon; depth, 636 feet; date, 1861.

DR. DAVIE WELL.—Location, 15 miles west of Macon; depth, 420 feet; date, 1861.

BERRY SMITH WELL.—Location, Prairie Point; depth, 350 feet; date, 1862.

W. V. STEWART WELL.—Location, 8 miles west of Crawford; depth, 450 feet; cost, $700; date, 1864.

WM. D. DEUPREE WELL.—Location, 7 miles southeast of Brookville; depth, 254 feet; date, 1865.

WM. MCCONNOR WELL.—Location, 13 miles east of Macon; depth, 317 feet; cost, $162.75; date, 1866.

CHARLES TATE WELL.—Location, about 7 miles east of Brookville; depth, 260 feet; date, 1866.

DR. WM. BOYKIN WELL.—Location, east of Macon; depth, 347 feet; date, 1866.

WM. MCLEOD WELL.—Location, about 8 miles east of Macon; depth, 814 feet; cost, $582.50; date, 1860.

DR. J. C. ROBERTS WELL.—Location, five and one-half miles east of Macon; depth, 600 feet; water rises within 30 feet of the mouth of the well.

ALABAMA PRAIRIE SECTION.

Gainsville.

GAINSVILLE WELLS.—Depth, 625 feet; water flows from wells on low ground.

SECTION OF GAINSVILLE WELLS.

(REPORTED BY LADD.)

	THICKNESS.	DEPTH.
Clay, sand and gravel	25 feet	25 feet.
Limestone (Selma chalk)	350 feet	375 feet.
Sand, soapstone and water	250 feet	625 feet.

Epps Station.

WELLBOURN WELL.—Depth, 703 feet; water flows a small stream.

SECTION OF WELLBORN WELL.

Soil	3 feet	3 feet.
Limestone (Selma chalk)	600 feet	603 feet.
Sand, gravel and clay	100 feet	703 feet.

Mr. Ladd reports that wells between Epps Station and Meridian have a depth of 1100 feet and that they do not flow except on low ground.

WELL STATISTICS AND WATER ANALYSES FOR THE EASTERN UNDERGROUND WATER AREA OF MISSISSIPPI.

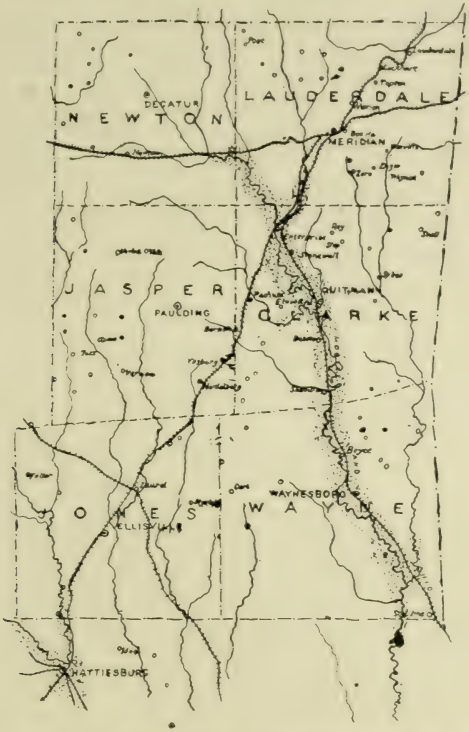

FIG. 14.—MAP OF THE EASTERN UNDERGROUND WATER AREA. Shaded portion shows the known and probable artesian area.

KEMPER COUNTY.

Scooba.

ANALYSIS OF WATER FROM SCOOBA MINERAL WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.4575
Oxides of Fe and Al.	.1239
Calcium oxide (lime)	41.7369
Magnesia	23.0460
Sulphur trioxide	37.6736
Potash	1.6324
Soda	23.3522
Chlorine	54.5700
Carbon dioxide	20.7593
Total solid matter	204.4669

Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	3.0216
Sodium chloride	43.9908
Magnesium chloride	37.4014
Calcium sulphate	61.6834
Calcium carbonate	29.1795
Magnesium carbonate	15.1156

The water from this well belongs to the chlor-sulfo-carbonate group of mineral waters.

The water was obtained from the public well at Scooba. The well has a depth of about 30 feet. The water is a type of the water from the sipe wells in the Flatwoods clays.

SCOTT COUNTY.

Forrest.

TOWN WELL.—Depth, 219 feet; water rises within 90 feet of surface; mouth of well about 475 feet above sea level.

SECTION OF TOWN WELL.

	THICKNESS.	DEPTH.
Mud or gumbo	60 feet	60 feet.
Black mud	15 feet	75 feet.
Grayish sandy clay	25 feet	100 feet.
Gray sand and iron pebbles	50 feet	150 feet.
Lime rock	40 feet	190 feet.
Sandy rock	5 feet	195 feet.
Dark gray hard rock	22 feet.	217 feet.
Water-bearing sand	2 feet	219 feet.

TOWN WELL NO. 2.—Depth, 260 feet; water within 90 feet of the surface; mouth of the well about 475 feet above sea level.

NEWTON COUNTY.

Hickory.

W. H. GALLASPIE WELL.—Water flows a good stream; mouth of the well about 320 feet above sea level; water belongs to the soft water group.

ANALYSIS OF WATER FROM HICKORY WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.9005
Oxides of Fe and Al.	.0490
Lime	1.1368
Magnesia	.3987
Sulphur trioxide	.0230
Potash	.3089
Soda	4.2772
Chlorine	.2116
Carbon dioxide	4.3624
Phosphoric acid	.0130
Total solid matter	12.6811
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.0501
Potassium chloride	.4452
Sodium carbonate	7.3113
Calcium carbonate	2.0296
Magnesium carbonate	.8384

Potability.—The amount of free ammonia found in a sample of this water is .50 parts and the amount of albuminoid ammonia .02 parts to the million.

LAUDERDALE COUNTY.

Meridian.

COTTON MILL WELL NO. 1.—Depth of well, 390 feet; water rises within 40 feet of surface; mouth of well about 336 feet above sea level.

SECTION OF WELL NO. 1.

	THICKNESS.	DEPTH.
Clay	14 feet	14 feet.
Sand	16 feet	30 feet.
Clay	6 feet	36 feet.
Shale	14 feet	50 feet.
Sand	1 foot	51 feet.
Lignite	2 feet	53 feet.
Sand	3 feet	56 feet.
Shale	2 feet	58 feet.
Pipe clay	19 feet	77 feet.
Lignite	6 feet	83 feet.

Pipe clay	7 feet	90 feet.
Sand	2 feet	92 feet.
Clay	3 feet	95 feet.
Sand	4 feet	99 feet.
Clay	22 feet	121 feet.
Sand	5 feet	126 feet.
Clay	5 feet	131 feet.
Sand	5 feet	136 feet.
Blue clay	4 feet	140 feet.
Sand	1 foot	141 feet.
Blue clay	18 feet	159 feet.
Sand	9 feet	168 feet.
Lignite	5 feet	173 feet.
Sand	2 feet	175 feet.
Lignite	4 feet	179 feet.
Sandstone	1 foot	180 feet.
Clay	7 feet	187 feet.
Sand	27 feet	214 feet.
Lignite and clay	8 feet	222 feet.
Clay	2 feet	224 feet.
Sand	2 feet	226 feet.
Lignite	2 feet	228 feet.
Sand	27 feet	255 feet.
Clay	12 feet	267 feet.
Lignite	4 feet	271 feet.
Clay	27 feet	298 feet.
Sand	4 feet	302 feet.
Clay	4 feet	306 feet.
Sand	6 feet	312 feet.
Clay	5 feet	317 feet.
Pyrites rock	1 foot	318 feet.
Sand	3 feet	321 feet.
Clay	7 feet	330 feet.
Lignite	2 feet	332 feet.
Clay	15 feet	347 feet.
Sand	43 feet	390 feet.

An analysis of water in this well showed traces of iron, silica and magnesia.

Cotton Mill Well No. 2.—Depth, 214 feet; water rises within 12 feet of the surface; mouth of the well about 336 feet above sea level; reported as good water for boiler purposes; with very slight traces of sulphates and carbonates.

Fertilizer Factory Well.—Depth, 260 feet; water within ten feet of the surface; capacity, level not reduced by using 3-inch pipe; mouth of well about 336 feet above sea level. An analysis made

by the Hartford Boiler Inspection Co. showed that this water contained 13.7 grains of solids per U. S. gallon. The mineral substances reported are lime carbonate, magnesium carbonate, soda sulphate, lime sulphate, soda chloride and magnesia sulphate.

Ice Company Well.—Depth, 900 feet; water stands within 30 feet of the surface; mouth of well about 336 feet above sea level; water colors vessels iron color.

City Well, corner of Fourth Street and Twenty Third Avenue.—Depth, 900 feet; water rises within 30 feet of the surface; mouth of well about 336 feet above sea level; water shows decided iron coloring.

Water Works Well.—Depth, 260 feet; water rises within ten feet of the surface; well located outside the city limits.

Mineral Springs.—There are a number of mineral springs in Lauderdale county. The Arundell Lithia springs south of Meridian and the Lauderdale springs east of Lauderdale are among the more celebrated.

ARTESIAN WELL AT ENTERPRISE, MISS.

CLARKE COUNTY.

Enterprise.

Town Well.—Depth, 156 feet; size of bore, two inches; water flows 15 gallons per minute; mouth of well about 230 feet above sea level.

SECTION OF TOWN WELL.

	THICKNESS.	DEPTH.
Sand	6 feet	6 feet.
Clay and sand	10 feet	16 feet.
Quick sand	6 feet	22 feet.
Hard Blue rock	5 feet	22.5 feet.
Blue soapstone (marl)	97.5 feet	120 feet.
White sand and blue rock	25 feet	145 feet.
Soft soapstone (clay)	7 feet	152 feet.
White sand and gravel	4 feet	156 feet.

ANALYSIS OF WATER FROM TOWN WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.8337
Oxides of Fe and Al.	.0437
Lime	.2157
Magnesia	.0699
Sulphur trioxide	.2332
Potash	.8855
Soda	8.4106
Chlorine	.2214
Carbon dioxide	6.3578
Phosphoric acid	.0536
Total solid matter	17.3251
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.5076
Potassium chloride	.4656
Potassium carbonate	.4653
Sodium carbonate	14.3737
Calcium carbonate	.3852
Magnesium carbonate	.1468

OLD SCHOOL HOUSE WELL.—Depth, 170 feet; water rises ten feet above the surface; mouth of well about 220 feet above sea level.

SECTION OF SCHOOL HOUSE WELL.

	THICKNESS.	DEPTH.
Surface sand	32 feet	32 feet.
Soapstone (clay)	20 feet	52 feet.
Shell rock	101 feet	153 feet.
Soapstone (clay)	15 feet	168 feet.
Water-bearing sand	2 feet	170 feet.

KAMPER WELL.—Location, one-fourth mile north of School house well; depth, 150 (?) feet; water flowing; mouth of well about 220 feet above sea level.

SECTION OF KAMPER WELL.

	THICKNESS.	DEPTH.
Surface sand	35 feet	35 feet.
Soapstone (clay)	20 feet	55 feet.
Shell rock	100 feet	155 feet.
Soapstone (clay)	15 feet	170 feet.
Water-bearing sand	2 feet	172 feet.

DEXTER WELL.—Location, one mile south of Enterprise on the west side of the Chickasawhay river; depth, 216 feet; flowing water; mouth of the well about 220 feet above sea level.

SECTION OF DEXTER WELL.

	THICKNESS.	DEPTH.
Surface sand	42 feet	42 feet.
Clay	20 feet	62 feet.
Shell rock	110 feet	172 feet.
Soapstone (clay) and water-bearing sand	44 feet	216 feet.

HALL WELL.—Location, two miles south of Enterprise on the west side of the river; depth, 239 feet; flowing water.

SECTION OF HALL WELL.

	THICKNESS.	DEPTH.
Surface sand	48 feet	48 feet.
Soapstone (clay)	23 feet	71 feet.
Shell rock	118 feet	189 feet.
Soapstone (clay) and water bearing sand	50 feet	239 feet.

F. F. KAMPER WELL.—Location, six miles south of Enterprise on the west side of the river; flowing water; depth of well, 340 feet.

SECTION OF KAMPER WELL.

	THICKNESS.	DEPTH.
Clay	16 feet	16 feet.
Sand	102 feet	118 feet.
Shell rock	140 feet	258 feet.
Soapstone and sand	82 feet	340 feet.

J. KAMPER WELL.—Location, eight miles south of Enterprise on west side of river; depth, 125 feet.

SECTION OF J. KAMPER WELL.

	THICKNESS.	DEPTH.
Surface sand	18 feet	18 feet.
Shell rock and sand	107 feet	125 feet.

FIG. 16.—WELL DERRICK AT ENTERPRISE, MISS.

Meyerhoff Springs.

MEYERHOFF HOTEL WELL.—Depth, 125 feet; flowing water; location, two and one-half miles east of the Chickasawhay river.

SECTION OF MYERHOFF WELL.

	THICKNESS.	DEPTH.
Surface Loam	11 feet	11 feet.
Shell rock	34 feet	45 feet.
Sand	80 feet	125 feet.

Quitman.

COURT HOUSE WELL.—Depth, 170 feet; flowing water; mouth of well about 231 feet above sea level.

SECTION OF COURT HOUSE WELL.

	THICKNESS.	DEPTH.
Surface soil	6 feet	6 feet.
Sand	41 feet	47 feet.
Shell rock	100 feet	147 feet.
Soapstone (clay) and sand	23 feet	170 feet.

JOHN KAMPER WELL NO. 1.—Location, four miles north of Quitman on the east side of the Chickasawhay river; flowing water; depth, 110 feet.

SECTION OF WELL NO. 1.

	THICKNESS.	DEPTH.
Surface sand	18 feet	18 feet.
Shell rock and sand	92 feet	110 feet.

JOHN KAMPER WELL NO. 2.—Location, five miles northwest of Quitman on the east side of the river; depth, 170 feet; flowing water.

SECTION OF WELL NO. 2.

	THICKNESS.	DEPTH.
Surface sand	18 feet	18 feet.
Shell rock	92 feet	110 feet.
Soapstone (clay) and sand	60 feet	170 feet.

J. W. MCGEE WELL.—Location, one and one-fourth miles southeast of Quitman; depth, 272 feet; flowing well.

SECTION OF McGEE WELL.

	THICKNESS.	DEPTH.
Surface sand	18 feet	18 feet.
Shell rock	20 feet	38 feet.
Sand	94 feet	132 feet.
Shell rock and sand	140 feet	272 feet.

ANALYSIS OF WATER FROM QUITMAN WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	2.1454
Oxides of Fe and Al.	.0349
Lime	2.4602
Magnesia	.6884
Sulphur trioxide	.1749
Potash	.4039
Soda	2.9339
Chlorine	.2706
Carbon dioxide	4.6957
Total solid matter	13.8079
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.3807
Potassium chloride	.3134
Sodium chloride	.2004
Sodium carbonate	4.8325
Calcium carbonate	4.3939
Magnesium carbonate	1.4456

ANALYSIS OF WATER FROM THE SPRING OF S. H. TERREL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.9180
Oxides of Fe and Al.	.0816
Lime	4.0343
Magnesia	.2560
Sulphur trioxide	.3159
Potash	.2621
Soda	3.6647
Chlorine	.3433
Carbon dioxide	14.0420
Total solid matter	24.9179

Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.4851
Sodium chloride	.5657
Sodium sulphate	.1649
Sodium carbonate	9.0204
Calcium carbonate	11.6704
Magnesium carbonate	.9344

Shubuta.

WEEMS WELL.—Depth, 400 feet; flowing water; mouth of well about 198 feet above sea level.

SECTION OF WEEMS WELL.

	THICKNESS.	DEPTH.
Sand and clay	25 feet	25 feet.
Marl	125 feet	150 feet.
Marl, clay and sand	250 feet	400 feet.

ANALYSIS OF WATER FROM WEEMS WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.2243
Oxides of Fe and Al.	.0641
Lime	.2448
Magnesia	.1399
Sulphur trioxide	.0983
Potash	.4213
Soda	22.8594
Chlorine	.2769
Carbon dioxide	16.5118
Total solid matter	41.8408
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.2139
Potassium chloride	.4978
Sodium chloride	.0663
Sodium carbonate	38.9849
Calcium carbonate	.4371
Magnesium carbonate	.2923

WAYNE COUNTY.

Waynesboro.

TOWN WELL.—Depth, 580 feet; flowing water; mouth of the well about 191 feet above sea level; overflowing water found at depths 180 and 480 feet.

SECTION OF WAYNESBORO WELL.

	THICKNESS.	DEPTH.
Surface clay	30 feet	30 feet.
Sand and water	150 feet	180 feet.
Marl and clay with flint bowlders	300 feet	480 feet.
Water-bearing sand	20 feet	500 feet.
Clay	80 feet	580 feet

ANALYSIS OF WATER FROM WAYNESBORO WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.5500
Oxide of Fe and Al.	.0800
Lime	.2400
Magnesia	.0700
Sulphur trioxide	.0800
Potash	.4180
Soda	31.2000
Chlorine	4.1880
Carbon dioxide	19.9071
Total solid matter	57.7331
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1740
Potassium chloride	.5120
Sodium chloride	6.5920
Sodium carbonate	47.3597
Calcium carbonate	.4280
Magnesium carbonate	.1470

Potability.—The water from the Waynesboro wells is reddish in color and contains considerable organic matter. The water from the above well contains .76 parts per million of free ammonia and .38 parts of albuminoids. The amount of organic matter renders this an unsafe water to be allowed to stand in open tanks before using.

JONES COUNTY.

Laurel.

TOWN WELL.—Depth, 420 feet; water rises within 40 feet of the surface; mouth of well about 240 feet above sea level.

Ellisville.

SECTION OF TOWN WELL.

	THICKNESS.	DEPTH.
Sand and gravel	80 feet	80 feet.
Green clay	280 feet	360 feet.
Sand	10 feet	370 feet.
Green clay	230 feet	600 feet.
Sand rock	12 feet	612 feet.
Greenish marl	288 feet	900 feet.
Shell rock	5 feet	905 feet.
Green marl	195 feet	1100 feet.
Shells	5 feet	1105 feet.
Green marl	295 feet	1400 feet.

This well did not furnish a supply of water. I understand that more recently a well has been drilled in another part of the town and water obtained at 640 feet. Mr. P. T. Doyle who drilled the first well thought that a pumping supply of water might have been obtained in the first well by stoping the drill at a depth of about 625 feet.

PERRY COUNTY.

FIG. 17.—AN ARTESIAN WELL AT HATTIESBURG, MISS.

Hattiesburg.

Wells in Hattiesburg vary in depth from 272 to 419 feet. The water rises from 4 to 27 feet above the surface. There are about twenty five wells in the town flowing from five to fifty gallons per minute.

GENERAL SECTION OF HATTIESBURG WELLS.

	THICKNESS.	DEPTH.
Pinkish clay	100 feet	100 feet.
Water and sand	30 feet	130 feet.
Greenish clay	150 feet	280 feet.
Water-bearing sand and gravel	20 feet	300 feet.

WATER COMPANY WELL NO. 1.—Depth, 287 feet; 6-inch pipe: mouth of well about 150 feet above sea level.

WATER COMPANY WELL NO. 2.—Depth, 295 feet; 3-inch pipe; mouth of the well same as the above; both flowing.

ANALYSIS OF WATER FROM WATER WORKS WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	2.0400
Oxides of Fe and Al.	.0787
Lime	.5247
Magnesia	.2320
Sulphur trioxide	.4248
Potash	.3690
Soda	.7041
Chlorine	.3690
Carbon dioxide	.8774
Total solid matter	5 6197
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.6830
Sodium chloride	.6084
Sodium sulphate	.1966
Sodium carbonate	.5057
Calcium carbonate	.9371
Magnesium carbonate	.4872

M. HEMPHILL WELL.—Depth, 321 feet; flowing water.

B. HEMPHILL WELL.—Depth, 311 feet; flowing water.

NEWMAN WELL.—Depth, 300 feet; flowing water.

ICE FACTORY WELL.—Depth, about 300 feet; flows 300 gallons per minute; mouth of well about 140 feet above sea level.

Mammoth Springs.

These springs are located five and one-half miles northwest of Hattiesburg on the line of the G. & S. I. R. R. They are justly celebrated for the abundance of their flow and the purity of their waters.

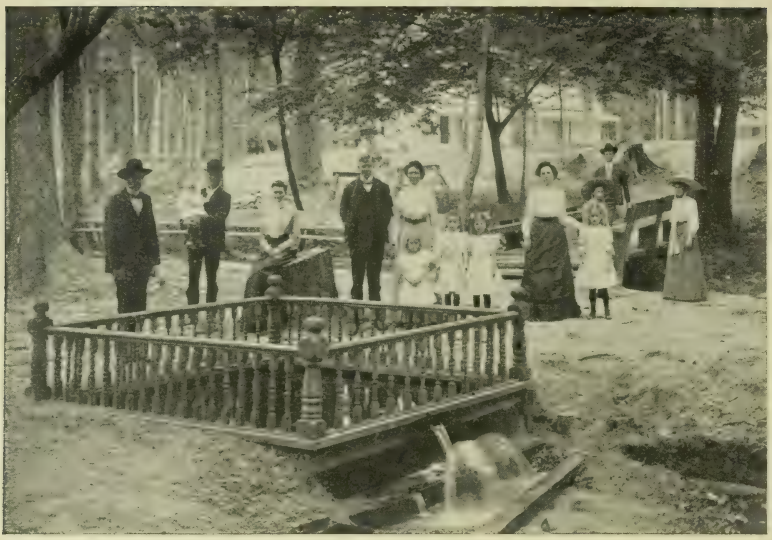

FIG. 18.—MAMMOTH SPRINGS.

MARION COUNTY.

Columbia.

TOWN WELL.—Location, three-eights of a mile east of Pearl river; depth, 409 feet.

SECTION OF COLUMBIA WELL.

	THICKNESS.	DEPTH.
Soil, clay, sand and gravel	18 feet	18 feet.
Clay	160 feet	178 feet.
(?)	142 feet	320 feet.
(?)	89 feet	409 feet.

ANALYSIS OF WATER FROM COLUMBIA WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	2.2403
Oxides of Fe and Al.	.0699
Lime	.3410
Magnesia	.0923
Sulphur trioxide	.8780
Potash	.3264
Soda	.9969
Chlorine	.3498
Phosphoric acid	.0233
Total solid matter	5.3179

Hypothetically combined as—	
Potassium sulphate	.6041
Sodium sulphate	1.0655
Sodium chloride	.5768
Sodium carbonate	.3862
Calcium carbonate	.6090
Magnesium carbonate	.1938

COVINGTON COUNTY.

Collins Well.

COLLINS WELL.—Depth, 560 feet; water rises within six feet of the surface.

Mish.

MISH WELL.—Depth, 360 feet; water 15 to 40 feet of the surface.

LAMAR COUNTY.

Lumberton.

CAMP-HINTON LUMBER CO. WELL.—Depth, 1800 feet; water at one level furnished a pumping capacity of 10 gallons per minute; mouth of the well about 250 feet above sea level; well cased with 8-inch pipe for 860 feet, then with 6-inch pipe to 1300 feet.

GENERAL SECTION OF LUMBERTON WELL.

	THICKNESS.	DEPTH.
Surface sand and clay	40 feet	40 feet.
Water-bearing sand and gravel	5 feet	45 feet.
White clay and fine sand	650 feet	695 feet.
Blue and green clays	200 feet	895 feet.
Blue clay and sand	505 feet	1400 feet.
Soft blue clay and sand	400 feet	1800 feet.

Mr. J. M. Jenkins furnished the following information in regard to the first 860 feet:

ROCK.	DEPTH IN FEET.
Coarse sand and some gravel	40
Fine sand	85–90
Fine sand and white clay	103
Hard white clay	110
Soft but fine sand	180
Hard white clay	200
Hard and soft spots, water white	210
Hard white clay, pipe goes 28in. per hr.	277

White water, pipe moves faster	314
Blue mud	512–528
Blue mud, still in water	560
Hard clay, white water	620
Very soft rock, water loses	650–670
Very soft white clay, 30 feet	682
Hard clay	720
Blue clay	760
Hard rock	770
Softer rock	784
Bluish rock	830
Hard rock	850
Sand	860

FIG. 19.—PALOL SPRINGS, NEAR HATTIESBURG, MISS.

LINCOLN COUNTY.

Brookhaven.

The wells at Brookhaven have a depth of about 750 feet; the water does not flow but is brought to the surface by means of deep well pumps and air-compressors; deep wells are owned by the city, the I. C. R. R., and the Pearl River Lumber Co.

ANALYSIS OF WATER FROM BROOKHAVEN WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.6820
Oxides of Fe and Al.	.0408
Lime	.3090
Magnesia	.0910
Sulphur trioxide	.1110
Potash	.3860
Soda	1.1360
Carbon dioxide	.2677
Total solid matter	4.6325
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.2415
Potassium chloride	.4049
Sodium chloride	2.1402
Magnesium chloride	.1607
Calcium carbonate	.5517
Magnesium carbonate	.0481

PIKE COUNTY.

Wells in the neighborhood of McComb have a depth of 40-60 feet. Water occurs at the base of the Lafayette formation and in some instances rises several feet in the well.

SMITH COUNTY.

Taylorsville.

TOWN WELL.—Depth, 1135 feet; water flowing 10 gallons per minute.

SECTION OF TOWN WELL.

	THICKNESS.	DEPTH.
Grayish brown clay	100 feet	100 feet.
Blue clay	200 feet	300 feet.
Sand, gravel and water	15 feet	315 feet.
Brownish clay	85 feet	400 feet.
Hard rock	23 feet	423 feet.
Sand	3 feet	426 feet.
Brownish clay	704 feet	1130 feet.
Brown sand very fine	5 feet	1135 feet.

The water at the 300-foot level rose within 10 feet of the surface. The brown sand at the bottom of the well was so fine as to go through a No. 60 wire gauze. The well is located about a mile from Leaf river.

ANALYSIS OF WATER FROM TAYLORVILLE WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.9911
Oxides of Fe and Al.	.0424
Lime	.1166
Magnesia	.0419
Sulphur trioxide	1.3175
Potash	.7695
Soda	13.5350
Chlorine	1.5622
Carbon dioxide	8.4024
Phosphoric acid	.0933
Total solid matter	26.8719
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	1.4243
Sodium chloride	2.5745
Sodium sulphate	1.1763
Sodium carbonate	19.9218
Calcium carbonate	.2082
Magnesium carbonate	.0879

WELL STATISTICS AND WATER ANALYSIS FOR THE SOUTHERN UNDERGROUND WATER AREA OF MISSISSIPPI.

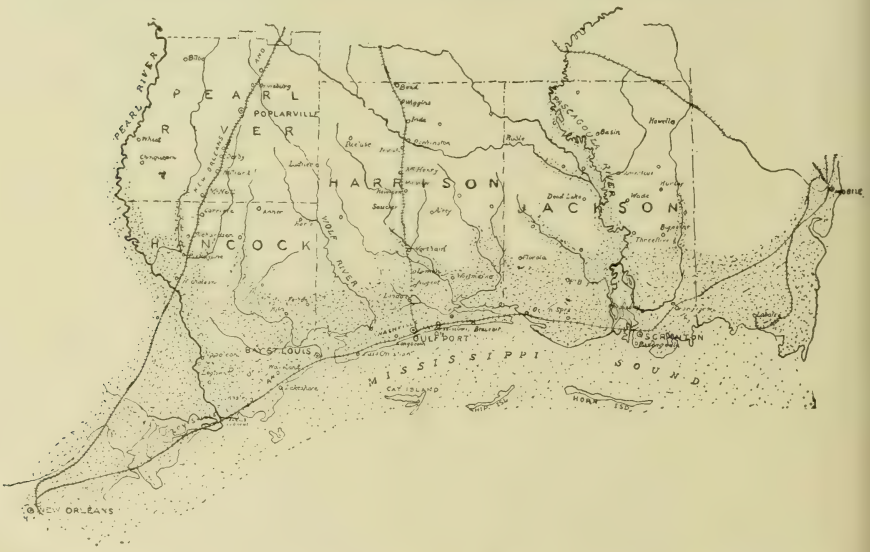

FIG. 20.—MAP OF THE SOUTHERN DEEP WELL AREA, including the Gulf Coast and Lower Pearl River artesian basin. Shaded portion, area of known and probable artesian water.

HANCOCK COUNTY.

Bay St. Louis.

WELL DRILLED BY MR. FRANK SUTER.—Depth, 860 feet; water flows 70 gallons per minute; mouth of the well a few feet above mean tide.

SECTION OF WELL DRILLED BY SUTER.

	THICKNESS.	DEPTH.
Yellow Clay	200 feet	200 feet.
Clay, deep orange	30 feet	230 feet.
Blue clay	220 feet	450 feet.
Water bearing sand	40 feet	490 feet.
Blue clay	260 feet	750 feet.
Shell rock	1 foot	751 feet.
Blue clay	49 feet	800 feet.
Water bearing sand	60 feet	860 feet.

Mr. Suter reports another well about a mile north of this one which has a depth of 600 feet. The flow is not as strong as in the first.

Mr. N. H. Darton of the U. S. G. S. reports other wells in Bay St. Louis as having depths of 400-600 feet and flowing 100-105 gallons per minute.*

Nicholson.

D. CARVER WELL.—Depth, 239 feet; water flows 30 gallons per minute; rises eight feet above the surface; mouth of well about 48 feet above sea level; well cased to a depth of 225 feet.

SECTION OF CARVER WELL.

	THICKNESS.	DEPTH.
Bluish gray clay	65 feet	65 feet.
Stiff clay	120 feet	185 feet.
Hard clay	11 feet	196 feet.
Sand and Water	10 feet	206 feet.
Clay	10 feet	216 feet.
Sand and water	9 feet	225 feet.

Mr. Carver reports that cypress bark was found in this well at a depth of 200 feet.

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*See *Water Supply and Irrigation paper No. 57, U. S. G. S.*

Slidell, La.

On the opposite side of the Pearl river valley, from Nicholson, at Slidell, La., water-bearing strata are found at three levels. The first water is found at 300 feet and flows 10 gallons per minute. A second water-bearing stratum occurs at the 450-foot level and yields 60 gallons per minute. A third occurs at a depth of 900 feet and yields 80 gallons per minute.

SECTION OF SLIDELL WELL.

	THICKNESS.	DEPTH.
Sand and gravel	300 feet	300 feet.
Clay	150 feet	450 feet.
Sand	40 feet	490 feet.
Clay	400 feet	890 feet.
Sand	10 feet	900 feet.

For the correlation of these water-bearing strata with those on the Mississippi side of Pearl river see Figure 6, representing a section from Lacy, Mississippi, to Slidell, La. The well at Pearl River Junction has a depth of 350 feet; flows 90 gallons per minute; mouth of well about 30 feet above sea level.

Picayune.

J. W. Simmons Well No. 1.—Depth, 500 feet; flowing water, rises several feet above the surface; mouth of the well about 60 feet above sea level.

Well No. 2.—Location, one and one-half miles northwest of Picayune; depth, 400 feet; water flowing.

Dr. E. Telly Well.—Location, two and one-half miles southeast of Picayune; depth, 400 feet; flowing water.

Lacy.

Lacy Well.—Depth, 840 feet; water at 500 feet rose within twelve feet of the surface; mouth of the well about 175 feet above sea level.

SECTION OF THE LACY WELL.

	THICKNESS.	DEPTH.
Sand and clay	100 feet	100 feet.
Blue clay	400 feet	500 feet.
Sand and clay	340 feet	840 feet.

HARRISON COUNTY.

Pass Christian.

The artesian wells at Pass Christian have a depth of 850 feet and flow 250 gallons per minute. Mr. Suter gives the following general section for the wells in this part of coast:

Mud and sand	100—150 feet.
Stiff blue clay	200—300 feet.
Water bearing sand	30 —50 feet.
Blue clay	100—200 feet.
Water bearing sand	75 —100 feet.
Total	505—800 feet.

ANALYSIS OF WATER FROM PASS CHRISTIAN PUBLIC WELL AT DEPOT.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.2884
Oxides of Fe and Al.	.0408
Lime	.0408
Magnesia	.0472
Sulphur trioxide	.0919
Potash	.2329
Soda	12.1923
Chlorine	3.6208
Carbon dioxide	6.6117
Phosphoric acid	.0541
Total solid matter	34,3083
Sulphuric acid, chlorine and carbon dioxide combined as—	
Posatsium sulphate	.2000
Potassium chloride	.1974
Sodium chloride	5.8153
Sodium carbonate	15.5693
Calcium carbonate	.2289
Magnesium carbonate	.0991
Silica	1.2884

Gulfport.

Railroad Shops Well.—Depth, 750 feet; water flows 250 gallons per minute; mouth of well about 15 feet above tide.

ANALYSIS OF WATER FROM RAILROAD WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.2126
Oxides of Fe and Al.	.0233
Lime	.1049
Magnesia	.0210
Sulphur trioxide	.4856
Potash	.2767
Soda	3.9026
Chlorine	.3433
Carbon dioxide	2.5221
Phosphoric acid	.0585
Total solid matter	8.9507
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.5121
Sodium sulphate	.4441
Sodium chloride	.5660
Sodium carbonate	5.8254
Calcium carbonate	.1873
Magnesium carbonate	.0441

PIER WELL.—Located on the pier some distance out in the sound so that the actual mouth of the well is about 20 feet below tide; depth, 800 feet; flows 200 gallons per minute.

ANALYSIS OF WATER FROM THE PIER WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.4167
Oxides of Fe and Al.	.0350
Lime	.0787
Magnesia	.0188
Sulphur trioxide	.3498
Potash	.1078
Soda	5.4623
Chlorine	.3433
Carbon dioxide	3.6007
Phosphoric acid	.0560
Total solid matter	11.4691
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1995
Sodium sulphate	.4581
Sodium chloride	.5660
Sodium carbonate	8.4805
Calcium carbonate	.1405
Magnesium	.0395

Mississippi City.*

"C. CLEMSHAW'S WELL.—Depth, 925 feet; mouth of well about 18 feet above tide; flow at 600 feet, 60 gallons per minute; at 900 feet, 200 gallons.

"E. P. ELLIS WELL.—Depth, 850 feet; 3-inch pipe; flow, 80 gallons per minute; 55 feet above tide.

"COURT-HOUSE WELL.—Pipe, 2 1-2 inches; reduced to 1 1-2 inches; flow, 20 gallons per minute; 28 feet above ground or about 50 feet above tide."

Biloxi.

FIG. 21.—AN ARTESIAN FOUNTAIN AT BILOXI, MISS.

ICE FACTORY WELL NO. 1.—Depth, 727 feet; water flows 100 gallons per minute; temperature of water, 79.5 F. (Harris.)

ANALYSIS OF WATER FROM WELL NO. 1

SUBSTANCE.	GRAINS PER GALLON.
Silica	2.3960
Oxides of Fe and Al.	.0437
Lime	.0437
Magnesia	.0136

*(*See Underground Waters of Southern La.—Harris.*)

Sulphur trioxide	.3498
Potash	.0663
Soda	4.4124
Chlorine	.3433
Carbon dioxide	2.8038
Phosphoric acid	.0639
Total solid matter	10.5365
Sulphuric acid, chlorine, carbon dioxide combined as—	
Potassium sulphate	.1227
Sodium sulphate	.5207
Sodium chloride	.5660
Sodium carbonate	6.3980
Calcium carbonate	.0780
Magnesium carbonate	.0285

Ice Factory Well No. 2.—Depth, 900 feet; very strong flow; temperature of water, 82.5 F. (Harris).

Waterworks Well.—Depth, 960 feet; flows 300 gallons per minute; water carried by 6-inch pipes to a height of 40 feet above the surface.

ANALYSIS OF WATER FROM A WATERWORKS WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.3992
Oxides of Fe and Al.	.0466
Lime	.1078
Magnesia	.0251
Sulphur trioxide	.1950
Potash	.0863
Soda	9.0893
Chlorine	1.6479
Carbon dioxide	
Phosphoric acid	.0583
Total solid matter	18.1153
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.5197
Sodium sulphate	.2158
Sodium chloride	2.7170
Sodium carbonate	12.9016
Calcium carbonate	.1925
Magnesium carbonate	.0527

WELL EAST OF R. R. STATION.—Location, "one mile east of station; depth, 918 feet; pipe, 6 and 4 inches; flow, at surface of the ground, 1000 gallons per minute; 500 gallons at elevation of 35 feet; 250 gallons at 55 feet. This indicates that the pressure head is not far from 75 feet above tide."*a*

SECTION OF THE ABOVE WELL.

	THICKNESS.	DEPTH.
Soil and clay	4 feet	4 feet.
Sand bearing good pumping water	61 feet	65 feet.
Whitish clay	35 feet	100 feet.
Greenish clay	390 feet	490 feet.
Sand, extremely fine at first, becoming carser below, coarse gravel	428 feet	918 feet.

Ship Island.

The water-bearing strata of the Mississippi coast extend outward toward the Gulf underneath the waters of the Mississippi Sound. At Ship Island, which lies out in the Sound about eleven miles south of Biloxi, there are two artesian wells.

The well at the light house has a depth of 750 feet and flows about 50 gallons per minute from a 2-inch pipe. Dr. Murdock gives the following section of this well:*b*

	THICKNESS.	DEPTH.
Sand	250 feet	250 feet.
Yellow clay	100 feet	350 feet.
Blackish mud	50 feet	400 feet.
Fine sand with shells	50 feet	450 feet.
Blue clay	250 feet	700 feet.
Water bearing sand	50 feet	750 feet.

The well at the quarantine station has a depth of 730 feet; both of these wells are about 10 feet above tide. Dr. P. C. Kallock gives the following section of the station well:*c*

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a(*Underground Waters of Southern La.—Harris.*)

b(*Underground Waters of La.—Harris.*)

*c*Harris, *loc. cit.*

	THICKNESS.		DEPTH.	
White sand	45	feet	45	feet.
Soft clay and mud	155	feet	200	feet.
Hard blue clay	100	feet	300	feet.
White sand	5	feet	305	feet.
Blue clay	260	feet	565	feet.
Sandstone	.5	feet	565.5	feet.
Blue clay	156	feet	721.5	feet.
Water bearing sand	9	feet	730.5	feet.

Millview.

MILLVIEW WELL.—Depth, 1150 feett no water; mouth of the well about 200 feet above sea level.

SECTION OF MILLVIEW WELL.

	THICKNESS.	DEPTH.
Sand	150 feet	150 feet.
Blue clay	900 feet	1050 feet.
Gray sand	100 feet	1150 feet.

Bond.

J. E. NORTH LUMBER CO. WELL.—Depth, 690 feet; water rises within 160 feet of the surface; mouth of the well about 306 feet above sea level.

SECTION OF NORTH WELL.

	THICKNESS.	DEPTH.
Yellow sand	160 feet	160 feet.
Blue clay	50 feet	210 feet.
Pipe clay	320 feet	530 feet.
Water bearing sand	160 feet	690 feet.

Lyman.

LYMAN WELL.—Depth, 480 feet; mouth of the well about 96 feet above sea level.

SECTION OF LYMAN WELL.

	THICKNESS.	DEPTH.
Yellow clay	40 feet	40 feet.
Red clay	20 feet	60 feet.
Blue clay	240 feet	300 feet.
Water sand	30 feet	330 feet.
Blue clay	45 feet	375 feet.
Water, sand and gravel	50 feet	425 feet.
Clay	55 feet	480 feet.

Wortham.

WORTHAM WELL.—Depth, 784 feet; water flowing 60 gallons per minute; mouth of well about 88 feet above sea level.

Howison.

HOWISON WELL.—Depth, 1500 feet; water rises within 35 feet of the surface; mouth of the well about 178 feet above sea level.

SECTION OF THE HOWISON WELL.

	THICKNESS.	DEPTH.
Red clay	100 feet	100 feet.
White sand	100 feet	200 feet.
Blue clay	1200 feet	1400 feet.
Water bearing sand	80 feet	1480 feet.

JACKSON COUNTY.

Ocean Springs.

OCEAN SPRINGS WELL.—Depth, 950 feet; water flows 250 gallons per minute; mouth of well about 25 feet above sea level.

SECTION OF OCEAN SPRINGS WELL.

	THICKNESS.	DEPTH.
Surface soil, sand and gravel	150 feet	150 feet.
Clay	250 feet	400 feet.
Sand	20 feet	420 feet.
Clay	40 feet	460 feet.
Sand and gravel	60 feet	520 feet.
Clay	400 feet	920 feet.
Water bearing sand	30 feet	950 feet.

ANALYSIS OF WATER FROM OCEAN SPRINGS WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.2767
Oxides of Fe and Al.	.0437
Lime	.1545
Magnesia	.0315
Sulphur trioxide	.1340
Potash	.0883
Soda	13.5803
Chlorine	5.8550
Carbon dioxide	6.1282
Phosphoric acid	.0485
Total solid matter	27.3357

Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium chloride	.1634
Sodium chloride	9.6408
Sodium sulphate	.1045
Sodium carbonate	14.4017
Calcium carbonate	.2758
Magnesium carbonate	.0662

Scranton.

SCRANTON WELL.—Depth, 800 feet; water flows 250 gallons per minute; mouth of well about 10 feet above tide: well drilled by Suter.

SECTION OF WELL AT SCRANTON.

	THICKNESS.	DEPTH.
Sand and gravel	350 feet	350 feet.
Blue clay	400 feet	750 feet.
Clam shells	5 feet	755 feet.
Blue clay	25 feet	780 feet.
Water bearing sand	20 feet	800 feet.

ANALYSIS OF WATER FROM SCRANTON WATERWORKS WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.2418
Oxide of Fe and Al.	.0437
Lime	.1690
Magnesia	.0377
Sulphur trioxide	.0811
Potash	.1055
Soda	17.5627
Chlorine	10.7573
Carbon dioxide	5.9674
Phosphoric acid	.0559
Total solid matter	36.0221
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1769
Potassium chloride	.0134
Sodium chloride	17.7170
Sodium carbonate	13.9699
Calcium carbonate	.3017
Magnesium carbonate	.0793

Moss Point.

WELL NEAR MOSS POINT.—Location, in sec. 25, T. 7 S; R. 6 W.; depth, 1550 feet; at 600 feet water and at 800 feet water flowed 75 gallons per minute.

SECTION OF WELL NEAR MOSS POINT.

	THICKNESS.	DEPTH.
Sand	100 feet	100 feet.
Clay and mud	150 feet	250 feet.
Hard clay	150 feet	400 feet.
Water-bearing sand	20 feet	420 feet.
Hard clay	200 feet	620 feet.
Water-bearing sand	40 feet	660 feet.
Sand and clay	110 feet	770 feet.
Water-bearing sand	44 feet	814 feet.
Hard rock, sand, mud and wood	736 feet	1550 feet.

DENNY SAW MILL WELL—Depth about 1000 feet; water flowing.

ANALYSIS OF WATER FROM DENNY WELL AT MOSS POINT.

SUBSTANCE.	GRAINS PER GALLON.
Silica	2.6759
Oxides of Fe and Al.	.0466
Lime	.1341
Magnesia	.0346
Sulphur trioxide	.0649
Potash	.0956
Soda	15.7471
Culorine	8.3952
Carbon dioxide	6.1155
Phosphoric acid	.0466
Total solid matter	33.3561
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1413
Potassium chloride	.0303
Sodium chloride	13.8115
Sodium carbonate	14.4019
Calcium carbonate	.2395
Magnesium carbonate	.0726
Silica	2.6757

This well is located at the Denny saw mill at Moss Point; the depth of the well is about 1000 feet; flows a strong stream; the water is from the 800-foot stratum of the above section.

DE SOTO
HERNANDO
TUNICA
TATE
SENATOBIA
TUNICA
RIVER
BARDIS
PANOLA
BATESVILLE
COAHOMA
QUITMAN
CLARKSDALE
BELEN
CHATEAU
CHATEAU
CHATEAU

TUNICA COUNTY.

Tunica.

TOWN WELL.—Depth, 860 feet; flows three and one-half gallons per minute; water rises 18 inches above the surface; mouth of the well about 194 feet above sea level.

ANALYSIS OF WATER FROM TUNICA WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.9050
Oxides of Fe and Al.	.1038
Lime	.0991
Magnesia	.0501
Sulphur trioxide	.0320
Potash	.2332
Soda	2.9996
Chlorine	.2214
Carbon dioxide	2.2137
Phosphoric acid	.0186
Total solid matter	7.8765
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.0696
Potassium chloride	.3094
Sodium chloride	.1224
Sodium carbonate	5.0154
Calcium carbonate	.1770
Magnesium carbonate	.1052

Potability.—The amount of free ammonia contained in this water is .08 parts and the amount of albuminoid ammonia .05 parts per million.

Near Longtown.

Location of well, five miles west of Longtown, near the southeast corner of Tunica county and about one half mile west of the Bluff; depth, 521 feet; water flows 15 gallons per minute; well cased with 2-inch pipe; mouth of well about 190 feet above sea level.

SECTION OF WELL.

	THICKNESS.	DEPTH.
Soil and clay	30 feet	30 feet.
Sand	110 feet	140 feet.
Pipe clay	260 feet	400 feet.
Rock	1 foot	401 feet.
Sand	10 feet	411 feet.
Soapstone (clay)	60 feet	471 feet.
Sand and water	50 feet	521 feet.

COAHOMA COUNTY.

Lyon.

W. T. Allen Well.—Depth, 975 feet; water flowing; mouth of well, about 170 feet above sea level; flow 16 gallons per minute; 4-inch pipe; water rises 35 feet above surface.

ANALYSIS OF WATER FROM LYON WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	2.2503
Oxides of Fe and Al.	.0758
Lime	.0932
Magnesia	.0145
Sulphur trioxide	.0600
Potash	.2332
Soda	11.2249
Chlorine	2.3903
Carbon dioxide	6.6404
Phosphoric acid	.1119
Total solid matter	23.0945
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1306
Potassium chloride	.2572
Sodium chloride	3.7378
Sodium carbonate	15.7978
Calcium carbonate	.1664
Magnesium carbonate	.0304

Clarksdale.

Town Well No. 1.—Depth, 900 feet; not flowing; mouth of well about 173 feet above sea level.

ANALYSIS OF WATER FROM WELL NO. 1.

SUBSTANCE.	GRAINS PER GALLON.
Silica	2.2620
Oxides of Fe and Al.	.0757
Lime	.0757
Magnesia	.0315
Sulphur trioxide	.0549
Potash	.2145
Soda	12.6651
Chlorine	2.6053
Carbon dioxide	7.5299
Phosphoric acid	.1225
Total solid matter	25.6371

Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1195
Potassium chloride	.2369
Sodium chloride	4.1081
Sodium carbonate	17.9236
Calcium carbonate	.1352
Magnesium carbonate	.0661

Potability.—The water from this well contains .55 parts per million of organic matter. There is .50 parts of free ammonia and .05 parts of albuminoids.

Town Well No. 2.—Depth, 330 feet; not flowing; mouth of well about 173 feet above sea level.

ANALYSIS OF WATER FROM WELL NO. 2.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.9736
Oxides of Fe and Al.	.0962
Lime	3 3930
Magnesia	1.7639
Sulphur trioxide	.0518
Potash	.2897
Soda	8.8386
Chlorine	1.1431
Carbon dioxide	10.1505
Phosphoric acid	.0053
Total solid matter	26.7057
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1127
Potassium chloride	.3457
Sodium chloride	1.6130
Sodium carbonate	13.6272
Calcium carbonate	6.0498
Magnesium carbonate	3.6042

Potability.—The amount of organic matter contained in this water consists of .60 parts of free ammonia and .05 parts per million of albuminoids.

Town Well No. 3.—Depth, 90 feet; water flowing; mouth of well about 173 feet above sea level.

ANALYSIS OF WATER FROM WELL NO. 3.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.7875
Oxides of Fe and Al.	.3463
Lime	3.7078
Magnesia	2.8625
Sulphur trioxide	.1059
Potash	.1924
Soda	.7071
Chlorine	.3987
Carbon dioxide	6.3491
Phosphoric acid	.0556
Total solid matter	16.5129
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.2305
Potassium chloride	.1071
Sodium chloride	.5731
Sodium carbonate	.6894
Calcium carbonate	6.6222
Magnesium carbonate	6.0112

Potability.—The water from this well contains .64 parts of free ammonia and .04 parts of albuminoids per million.

BOLIVAR COUNTY.

Cleveland.

TOWN WELL.—Depth, 1000 feet; water flows 100 gallons per minute; rises 47 feet above the surface; mouth of well about 139 feet above sea level.

ANALYSIS OF WATER FROM CLEVELAND WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.0581
Oxides of Fe and Al.	.4081
Lime	.0874
Magnesia	.0466
Sulphur trioxide	.0569
Potash	.2623
Soda	19.9631
Carbon dioxide	14.1818
Phosphoric acid	.3022
Total solid matter	36.6617

Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1238
Potassium chloride	.3091
Sodium chloride	.2445
Sodium carbonate	33.8954
Calcium carbonate	.1561
Magnesium carbonate	.0978

Potability.—This water contains .78 parts of free ammonia and .06 parts of albuminoid ammonia to the million.

SUNFLOWER COUNTY.

Moorehead.

VILLAGE WELL.—Depth, 832 feet; strong flow; water rises 40 feet above the surface; mouth of the well about 100 feet above sea level.

ANALYSIS OF WATER FROM COTTON FACTORY WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.8628
Oxide of Fe and Al.	.0384
Lime	.1166
Magnesia	.1164
Sulphur trioxide	.0859
Potash	.2472
Soda	24.0412
Chlorine	.2706
Carbon dioxide	17.1652
Phosphoric acid	.0816
Total solid matter	43.0259
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1870
Potassium chloride	.2311
Sodium chloride	.2650
Sodium carbonate	40.8464
Calcium carbonate	.2082
Magnesium carbonate	.2444

Indianola.

TOWN WELL NO. 1.—Depth, 1240 feet; strong flow; water rises 49 feet above the surface; mouth of the well about 141 feet above sea level.

ANALYSIS OF WATER FROM WELL NO. 1.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.4342
Oxides of Fe and Al.	.0583
Lime	.0699
Magnesia	.0298
Sulphur trioxide	.0460
Potash	.0298
Sulphur trioxide	.0460
Potash	.1912
Soda	21.4257
Chlorine	.5317
Carbon dioxide	15.0094
Phosphoric acid	.3189
Total solid matter	39.1151
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1001
Potassium chloride	.2166
Sodium carbonate	35.9844
Calcium carbonate	.1248
Magnesium carbonate	.0626

Potability.—The amount of free ammonia found in a sample of this water is .128 parts and the amount of albuminoid ammonia .448 parts per million.

TOWN WELL NO. 2.—Depth, 1320 feet; water flows 200 gallons per minute; 4-inch pipe used; mouth of well about 141 feet above sea level.

Ruleville.

RULE BROS. WELL.—Depth, 850 feet; water flows a strong stream and rises 70 feet above the surface; mouth of the well about 131 feet above sea level.

ANALYSIS OF WATER FROM RULE BROS. WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.0843
Oxide of Fe and Al.	.0553
Lime	.1224
Magnesia	.0545
Sulphur trioxide	.0605
Potash	.2553

Soda	14.3000
Chlorine	.2706
Carbon dioxide	9.2131
Phosphoric acid	.2211
Total solid matter	25.6370
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1317
Potassium chloride	.2912
Sodium chloride	.2179
Sodium carbonate	23.2413
Calcium carbonate	.2186
Magnesium carbonate	.1144

Potability.—The amount of free ammonia in this water is .455 parts per million and the amount of albuminoids .130 parts. No other organic matter was found in the water.

Doddsville.

VILLAGE WELL.—Depth, 820 feet; water rises 70 feet above the surface; strong flow; mouth of well about 124 feet above sea level.

ANALYSIS OF WATER FROM DODDSVILLE WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.2060
Oxides of Fe and Al.	.1457
Lime	.2069
Magnesia	.0482
Sulphur trioxide	.1737
Potash	.4557
Soda	15.1111
Chlorine	.2214
Carbon dioxide	10.9083
Total solid matter	28.6722
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.3781
Potassium chloride	.3975
Sodium chloride	.0534
Sodium carbonate	25.7755
Calcium carbonate	.3695
Magnesium carbonate	.1012

Potability.—The amount of organic matter found in this water in high. There are .144 parts of free ammonia and .504 parts albuminoids per million.

Sunflower.

VILLAGE WELL.—Depth, 800 feet; water flows ten gallons per minute; mouth of well about 117 feet above sea level; well section consists of soil, soapstone (clay) and alternate layers of clay and sand; water is found under two layers of rock which are close together and have a thickness of 1 1-2 and 2 feet respectively.

ANALYSIS OF WATER FROM THE SUNFLOWER WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	2.4602
Oxide of Fe and Al.	.1107
Lime	.1166
Magnesia	.0868
Sulphur trioxide	.1037
Potash	.1224
Soda	19.3174
Chlorine	.2706
Carbon dioxide	13.7263
Phosphoric acid	.2273
Total solid matter	36.5420
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.2257
Sodium chloride	.4005
Sodium carbonate	32.6508
Calcium carbonate	.2072
Magnesium carbonate	.1823

Potability.—The amount of organic matter contained in this water is moderately high. There are .18 parts of free ammonia and .254 parts of albuminoids.

Dockery.

WM. DOCKERY WELL NO. 1.—Depth, 961 feet; flows 35 gallons per minute; water will rise in pipe 50 feet above the surface; mouth of the well about 130 feet above sea level.

ANALYSIS OF WATER FROM WELL NO. 1.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.3817
Oxides of Fe and Al.	.0437
Lime	.0933
Magnesia	.0377
Sulphur trioxide	.0499
Potash	.4646
Soda	14.5660
Chlorine	.3550
Carbon dioxide	10.4111
Phosphoric acid	.3544
Total solid matter	27.7574
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1086
Potassium chloride	.6421
Sodium chloride	.0810
Sodium carbonate	24.8199
Calcium carbonate	.1666
Magnesium carbonate	.0797

WM. DOCKERY WELL NO. 2.—Location, one and a half miles east of No. 1; depth, 929 feet; water flows 80 gallons per minute; has pressure of 35 pounds per square inch; mouth of well about 130 feet above sea level.

ANALYSIS OF WATER FROM WELL NO. 2.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.4458
Oxides of Fe and Al.	.0495
Lime	.0962
Magnesia	.0377
Sulphur trioxide	.0585
Potash	.9124
Soda	14.5247
Chlorine	.8521
Carbon dioxide	10.2802
Phosphoric acid	.2909
Total solid matter	28.5480

Sulphuric acid chlorine and carbon dioxide combined as—	
Potassium sulphate	.1275
Potassium chloride	1.3375
Sodium chloride	.3587
Sodium carbonate	24.4978
Calcium carbonate	.1718
Magnesium carbonate	.0791

TALLAHATCHIE COUNTY.

Leverett.

LEVERETT WELL.—Location, ten miles south of Charleston, one-half mile west of the Bluff; depth, 380 feet; water flows 150 gallons per minute; well cased with two inch pipe; mouth of well about 145 feet above sea level.

SECTION OF LEVERETT WELL.

	THICKNESS.	DEPTH.
Soil and clay	30 feet	30 feet.
Sand	80 feet	110 feet.
Soapstone (clay)	70 feet	180 feet.
Thin rock, sand and water	200 feet	380 feet.

Crevi.

CREVI WELL.—Location, twelve miles north of Charleston; depth, 400 feet; flowing well; cased with 2-inch pipe; mouth of well about 155 feet above sea level; well on low land near the Bluff.

SECTION OF THE CREVI WELL.

	THICKNESS.	DEPTH.
Soil and pipe clay	50 feet	50 feet.
Sand	90 feet	140 feet.
Soapstone (clay)	60 feet	200 feet.
Rock about	1 foot	201 feet.
Water-bearing sand	200 feet	401 feet.

Charleston.

TOWN WELL.—Depth, 760 feet; water flows 25 gallons per minute; well cased with 2-inch pipe; mouth of well about 150 feet above sea level and 40 feet above the bottom land.

SECTION OF CHARLESTON WELL.

	THICKNESS.	DEPTH.
Clay and Blue Mud	50 feet	50 feet.
Sand	40 feet	90 feet.
Soapstone(clay)	100 feet	190 feet.
Hard white rock	2 feet	192 feet.
Water-bearing sand	100 feet	292 feet.
Soapstone (clay)	30 feet	322 feet.
Water-bearing sand	40 feet	362 feet.

Glendora.

M. P. STURDIVANT WELL.—Depth, 650 feet; water flows 100 gallons per minute; mouth of well about 125 feet above sea level.

ANALYSIS OF WATER FROM STURDIVANT WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.7604
Oxides of Fe and Al.	.0495
Lime	.0903
Magnesia	.0534
Sulphur trioxide	.0999
Potash	.1378
Soda	9.6085
Chlorine	1.0630
Carbon dioxide	6.2925
Phosphoric acid	.1580
Total solid matter	19.3133
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.2174
Potassium chloride	.0320
Sodium chloride	1.7267
Sodium carbonate	14.8553
Calcium carbonate	.1612
Magnesium carbonate	.1121

WASHINGTON COUNTY.

Leland.

TOWN WELL.—Depth, 527 feet; water 17 feet of surface; 4-inch pipe used; mouth of well about 144 feet above sea level.

SECTION OF LELAND WELL.

	THICKNESS.	DEPTH.
Buckshot clay	2 feet	2 feet.
Fine sandy silt	60 feet	62 feet.
Gravel	14 feet	76 feet.
Sandy soil	64 feet	140 feet.
Hard rock	2 feet	142 feet.
Blue clay with 3 strata of hard rock	300 feet	442 feet.
Fine sand and water	85 feet	527 feet.

ANALYSIS OF WATER FROM LELAND WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.4808
Oxides of Fe and Al.	.0875
Lime	.1399
Magnesia	.0251
Sulphur trioxide	.0700
Potash	.2069
Soda	9.9137
Chlorine	1.4887
Carbon dioxide	6.3024
Total solid matter	19.7150
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.6524
Potassium chloride	.1967
Sodium chloride	2.2992
Sodium carbonate	14.8600
Calcium carbonate	.2498
Magnesium carbonate	.0527

Potability.—The water from this well contains considerable organic matter. There are .29 parts of free ammonia and .072 parts of albuminoids.

Greenville.

TOWN WELLS.—Depth, 450 feet; water rises within 10 feet of surface; four wells supply two and one-half millions gallons per day; mouth of wells about 148 feet above sea level.

ANALYSIS OF WATER FROM GREENVILLE WELL.

SUBSTANCE.	GRAINS PER GALLON
Silica	1.4575
Oxides of Fe and Al.	.0232
Lime	.0495
Magnesia	.0577
Sulphur trioxide	.0899
Potash	.1888
Soda	9.6368
Chlorine	1.8940
Carbon dioxide	5.7984
Phosphoric acid	.0932
Total solid matter	19.2891
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1957
Potassium chloride	.1316
Sodium chloride	3.0197
Sodium carbonate	13.7302
Calcium carbonate	.0884
Magnesium carbonate	.1211

Potability.—There is an appreciable amount of organic matter in this water. There are .168 parts of free ammonia and .032 parts of albuminoids per million. There is also a trace of nitrates.

LEFLORE COUNTY.

Greenwood.

T. B. MINYARD WELL.—Depth, 375 feet; mouth of the well about 153 feet above sea level.

SECTION OF MINYARD WELL.

	THICKNESS.	DEPTH.
Soil and clay	15 feet	15 feet.
Mud or silt	140 feet	155 feet.
Soapstone (clay)	200 feet	355 feet.
Green sand with thin strata of hard rock	20 feet	375 feet.

ANALYSIS OF WATER FROM GREENWOOD (McNEAL WELL.)

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.6250
Oxides of Fe and Al.	.1130
Lime	1.3230

Magnesia	.4370
Sulphur trioxide	.2060
Potash	.6550
Soda	2.4120
Chlorine	.4370
Carbon dioxide	3.1508
Phosphoric acid	.0080
Total solid matter	10.3668
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.4460
Potassium chloride	.6530
Sodium chloride	.2090
Sodium carbonate	3.9350
Calcium carbonate	2.3620
Magnesium carbonate	.9170

Potability.—The amount of organic matter in this water is as follows: Of the total amount free ammonia constitutes .64 parts and the remaining .04 parts are albuminoids.

ANALYSIS OF WATER FROM CITY WELL, GREENWOOD.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.8305
Oxides of Fe and Al.	.0466
Lime	.8703
Magnesia	.2915
Sulphur trioxide	.1061
Potash	.4500
Soda	2.8953
Chlorine	.2445
Carbon dioxide	3.0573
Total solid matter	9.7921
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.2309
Potassium chloride	.5144
Sodium carbonate	4.9480
Calcium carbonate	1.5543
Magnesium carbonate	.6121

The water from this well belongs to the soft water group.

T. B. MINYARD WELL.—Location, eight miles southeast of Greenwood one-half mile from the Bluff; depth, 266 feet; water flows 200 gallon per minute; mouth of well about 140 feet above sea level;well cased with 2-inch pipe.

SECTION OF MINYARD WELL.

	THICKNESS.	DEPTH.
Soil and clay	10 feet	10 feet.
Sand	5 feet	15 feet.
Blue mud	25 feet	40 feet.
Sand	72 feet	112 feet.
Soapstone (clay)	80 feet	192 feet.
Shell rock	2 feet	194 feet.
Water-bearing sand	72 feet	266 feet.

WELL DRILLED BY T. B. MINYARD, NORTHEAST OF GREENWOOD 4 MILES.—Depth, 220 feet; water flows 30 gallons per minute; mouth of well about 155 feet above sea level; well cased with 2-inch pipe.

SECTION OF THE ABOVE WELL.

	THICKNESS.	DEPTH.
Soil and blue mud	50 feet	50 feet.
Sand	78 feet	128 feet.
Soapstone (clay)	50 feet	178 feet.
Shell rock	5 feet	183 feet.
Water-bearing sand	37 feet	220 feet.

Minter City.

Mr. Chas. A. Towne is reported to have an artesian well at this point but the writer was unable to secure any information further than that mentioned.

Schalter.

R. B. SCHALTER WELL.—Depth, 512 feet; flowing water; good flow. This well is about 10 miles north of the Ittabena well which has a depth of 605 feet. The difference in elevation is so slight that the dip of the water-bearing stratum southward is about 10 feet per mile.

DR. WILSON WELL.—An artesian well having about the same depth as the above.

ED. JONES WELL.—An artesian well having about the same depth as the above.

Highlandale.

An artesian well is owned by Mr. B. L. Jones.

Shellmound.

W. S. Wingfield has an artesian well at this place.

Sunnyside.

An artesian well at this place is owned by Mr. J. K. Towne.

Ittabena.

TOWN WELL.—Depth, 605 feet; mouth of well about 107 feet above sea level; water flows a good stream; sample of water for analysis sent by Maj. W. H. Morgan.

ANALYSIS OF WATER FROM ITTABENA WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.6610
Oxide of Fe and Al.	.1510
Lime	.3320
Magnesia	.1630
Sulphur trioxide	.1540
Potash	.3410
Soda	7.2810
Chlorine	.2910
Carbon dioxide	5.3117
Total solid matter	15.6857
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.3350
Potassium chloride	.2540
Sodium chloride	.2810
Sodium carbonate	11.7490
Calcium carbonate	.5920
Magnesium carbonate	.3420

YAZOO COUNTY.

Yazoo City.

CITY WELL NO. 1.—Depth, 1000 feet; water flowing; mouth of well about 120 feet above sea level.

SECTION OF WELL NO. 1.

	THICKNESS.	DEPTH.
Soil and yellow clay	50 feet	50 feet.
Clay	40 feet	90 feet.
Sand	50 feet	140 feet.
Alternate layers of sand, clay and lignite	860 feet	1000 feet.

ANALYSIS OF WATER FROM MAIN STREET WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.1310
Oxides of Fe and Al.	.1428
Lime	.0643
Magnesia	.0441
Sulphur trioxide	.0769
Potash	.1574
Soda	11.0845
Chlorine	.3444
Carbon dioxide	7.7773
Phosphoric acid	.0781
Total solid matter	20.2008
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1674
Potassium chloride	.1058
Sodium chloride	.4849
Sodium carbonate	18.5042
Calcium carbonate	.1164
Magnesium carbonate	.0926

CITY WELL No. 2.—Depth, 800 feet; water found at 650 and 800 feet; mouth of well about 130 feet above sea level.

ANALYSIS OF WATER FROM WATERWORKS WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.3583
Oxide of Fe and Al.	.9328
Lime	.8745
Magnesia	.3498
Sulphur trioxide	.6296
Potash	.3731
Soda	4.9042
Chlorine	.4428
Carbon dioxide	4.1023
Phosphoric acid	.0503
Total solid matter	14.0177
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.6906
Sodium sulphate	.5539
Sodium chloride	.7301
Sodium carbonate	7.3058
Calcium carbonate	1.5619
Magnesium carbonate	.7346

ANALYSIS OF WATER FROM A. M. KOLMES WELL.

SSBSTANCE.	GRAINS PER GALLON.
Potassium sulphate	2.884
Sodium chloride	54.987
Sodium sulphate	29.162
Calcium sulphate	111.306
Magnesium sulphate	106.017
Magnesium carbonate	18.775
Soluble silica	1.392
Iron carbonate	1.207
Total solid matter	325.730

This water belongs to the sulphate group of mineral waters.

FIG. 23.—A WELL DRILLER'S OUTFIT.

PANOLA COUNTY.

Batesville.

PUBLIC WELL.—Depth, 302 feet; water flows 50 gallons per minute; rises 20 feet above the surface; mouth of the well about 234 feet above sea level; Austin rock drill and jolly attachment used for drilling; 4-inch pipe.

SECTION OF BATESVILLE WELL.

	THICKNESS	DEPTH.
Surface	10 feet	10 feet.
White sand	25 feet	35 feet.
Blue clay	10 feet	45 feet.
Clay and sand	215 feet	260 feet.
Rock	2 feet	262 feet.
Water-bearing sand	40 feet	302 feet.

ANALYSIS OF WATER FROM BATESVILLE WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.7490
Oxides of Fe and Al.	1.0027
Lime	.2215
Magnesia	.2407
Sulphur trioxide	.2297
Potash	.2430
Soda	.4706
Chlorine	.3192
Carbon dioxide	.5596
Total solid matter	5.0360
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.4497
Sodium chloride	.5260
Sodium sulphate	.0408
Sodium carbonate	.2927
Calcium carbonate	.3966
Magnesium carbonate	.5054

Sardis.

RAILROAD WELL.—Depth, 210 feet; not flowing; abundance of water; pipe, 4-inch; mouth of well about 384 feet above sea level.

WATER WORKS WELL.—Depth, 194 feet; not flowing; 4-inch pipe.

SAW MILL WELL.—Depth, 149; steam pump; 4-inch pipe.

TOWN WELL.—Depth, 138 feet; not flowing; 2-inch pipe.

TAYLOR WELL.—Depth, 140 feet; not flowing; 2-inch pipe.

WILLIAMSON WELL.—Depth, 136 feet; not flowing; 2-inch pipe.

ANALYSIS OF WATER FROM RAILROAD WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.8280
Oxides of Fe and Al.	.0380
Lime	.3380

Magnesia	.1400
Sulphur trioxide	.1690
Potash	.0990
Soda	1.5620
Chlorine	1.1190
Carbon dioxide	.7845
Total solid matter	5.0775
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1830
Sodium chloride	1.8460
Sodium sulphate	.1510
Sodium carbonate	1.3980
Calcium carbonate	.6030
Magnesium carbonate	.2940

QUITMAN COUNTY.

Riverside.

L. Marks Well.—Depth, 636 feet; flows 60 gallons per minute; pressure 30 pounds per square inch; 3-inch pipe; water rises 40 feet above the surface in a one and one-fourth inch pipe; mouth of the well about 160 feet above sea level.

SECTION OF THE MARKS WELL.

	THICKNESS.	DEPTH.
Blue mud	40 feet	40 feet.
Mud and water-bearing sand	45 feet	85 feet.
Water-bearing sand and gravel	50 feet	135 feet.
Sand and gravel	40 feet	175 feet.
Soapstone (clay)	220 feet	395 feet.
Rock	.5 feet	395.5 feet.
Soapstone (clay)	50 feet	445.5 feet.
Rock	.5 foot	446 feet.
Green sand	10 feet	456 feet.
Lignite	1 foot	457 feet.
Soapstone (clay) and water-bearing sand	179 feet	636 feet.

ANALYSIS OF WATER FROM MARKS WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	4.3258
Oxides of Fe and Al.	.0875
Lime	.2624
Magnesia	.1026
Sulphur trioxide	.1639
Potash	.4545
Soda	3.5713

Chlorine	.2658
Carbon dioxide	2.8081
Total solid matter	12.0419
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.3568
Potassium chloride	.4133
Sodium chloride	.1142
Sodium carbonate	5.9999
Calcium carbonate	.4686
Magnesium carbonate	.2154

Potability.—This water contains .80 parts of free ammonia and .03 parts of albuminoid ammonia to the million.

TATE COUNTY.

Senatobia.

SENATOBIA WELL.—Depth, 120 feet; water stands 40 feet from the surface; mouth of well about 284 feet above sea level.

SECTION OF SENATOBIA WELL.

	THICKNESS.	DEPTH.
Clay	24 feet	24 feet.
Coarse gravel	15 feet	39 feet.
Quick sand	21 feet	60 feet.
Clay	4 feet	64 feet.
Sand	10 feet	74 feet.
White clay	2 feet	76 feet.
Sand	14 feet	90 feet
Pipe clay	2 feet	92 feet.
Water-bearing sand	28 feet	120 feet.

ANALYSIS OF WATER FROM SENATOBIA WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.8861
Oxides of Fe and Al.	.0233
Lime	.4139
Magnesia	.1616
Sulphur trioxide	.1191
Potash	.0675
Soda	.6572
Chlorine	.4570
Carbon dioxide	.6512
Total solid matter	3.4369

Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1249
Sodium chloride	.7531
Sodium sulphate	.1095
Sodium carbonate	.3592
Calcium carbonate	.7392
Magnesium carbonate	.3393

HOLMES COUNTY.

Lexington.

LEXINGTON WELLS.—Located in valley; depth about 100 feet; pass through soil, clay and water-bearing sand; mouths of wells about 209 feet above sea level.

ANALYSIS OF WATER FROM OIL MILL WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.5216
Oxides of Fe and Al.	.1078
Lime	1.2009
Magnesia	.5422
Sulphur trioxide	.1299
Potash	.2098
Soda	.6338
Chlorine	.4734
Carbon dioxide	1.8416
Total solid matter	6.6410
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.2818
Potassium chloride	.0915
Sodium chloride	.7092
Sodium carbonate	.4207
Calcium carbonate	2.1448
Magnesium carbonate	1.5216

G. A. WILSON WELL.—Depth, 800 feet; will flow from an inch pipe 50 feet above the surface; mouth of well about 239 feet above sea level.

ANALYSIS OF WATER FROM WILSON WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	2.2911
Oxides of Fe and Al.	.0670
Lime	.1574
Sulphur trioxide	.0658

Magnesia	.0398
Potash	.2279
Soda	15.7365
Chlorine	.3206
Carbon dioxide	11.0148
Total solid matter	29.9209
Hypothetically combined as—	
Potassium sulphate	.1452
Potassium chloride	.2380
Sodium chloride	.3421
Sodium carbonate	26.5838
Calcium carbonate	.2811
Magnesium carbonate	.0836

There are six of the deep wells in Lexington. They supply nearly every house with water. Two of the wells are in the valley of Black Creek, the others are in the Public Square, about 30 feet higher.

Durant.

DURANT WELL.—Depth, 325 feet; water rises to surface in weak flow; mouth of well about 266 feet above sea level; strata consist of alternate layers of clay and soft sandstone; water is obtained under a lignitic formation at a depth of 275 feet.

ANALYSIS OF WATER FROM DURANT I. C. R. R. WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.4924
Oxides of Fe and Al.	.0349
Lime	.4022
Magnesia	.7681
Sulphur trioxide	1.2467
Potash	.8570
Soda	5.7989
Chlorine	.6888
Carbon dioxide	4.5613
Phosphoric acid	.0148
Total solid matter	15.8651
Sulphuric acid, chlorine and carbon dioxide combined ac—	
Potassium sulphate	1.5863
Sodium sulphate	.9184
Sodium chloride	1.1357
Sodium carbonate	8.1963
Calcium carbonate	.7183
Magnesium carbonate	1.6130

Tchula.

TOWN WELL.—Depth, 1130 feet; water flows 120 gallons per minute; pressure 50 lbs.; mouth of well about 130 feet above sea level: at 985 feet, there is 25 feet of hard rock, then 125 feet of sandstone; water for analysis sent by Dr. Henry Christmas; water belongs to carbonate group.

ANALYSIS OF WATER FROM TCHULA WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	2.3720
Oxides of Fe and Al.	
Lime	.1640
Magnesia	.0300
Sulphur trioxide	.0120
Potash	.1580
Soda	17.8010
Chlorine	.3000
Carbon dioxide	12.6778
Phosphoric acid	.0410
Total solid matter	33.5558
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.0260
Potassium chloride	.2270
Sodium chloride	.3570
Sodium carbonate	30.1820
Calcium carbonate	.2920
Magnesium carbonaite	.0630

West.

The wells at West have a depth of 310 feet; the mouths of the wells are about 290 feet above sea level; the wells are located in the Black river valley and have a good flow.

MARSHALL COUNTY.

Holly Springs.

TOWN WELL.—Depth, 400 feet; water rises to 175 feet of surface; mouth of well about 600 feet above sea level; well cased with ten inch pipe for 107 feet.

SECTION OF TOWN WELL.

	THICKNESS.	DEPTH.
Reddish clay (Columbia formation)	20 feet	20 feet.
Red sand (Lafayette)	87 feet	107 feet.

Sand rock	1 foot	108 feet.
Clay (Lagrange)	52 feet	160 feet.
Hard sandstone	.5 feet	160.5 feet
Clay and sandstone	139.5 feet	300 feet.
Fine water sand	40 feet	340 feet.
Pipe clay	13 feet	353 feet.
Coarse sand	4 feet	357 feet.
Sticky clay	43 feet	400 feet.

Well drillers report wells south of Holly Springs and as far north as Red Banks at depths varying from 200 to 220 feet. No flowing wells.

GENERAL SECTION OF WELLS ABOUT HOLLY SPRINGS.

	THICKNESS.	DEPTH.
Orange sand	50 feet	50 feet.
Blue clay	50 feet	110 feet.
Hard rock	1.5 feet	111.5 feet.
Hard clay	170 feet	181.5 feet.
Water-bearing sand	47 feet	218.5 feet.
Blue clay containing lignite	140 feet	358.5 feet.
Soft rock	1.5 feet	360 feet.
Water-bearing sand	23 feet	383 feet.

ANALYSIS OF WATER FROM HOLLY SPRINGS WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.6821
Oxide of Fe and Al.	.0116
Lime	.5247
Magnesia	.1973
Sulphur trioxide	.0259
Potash	.1649
Soda	.8475
Chlorine	.9348
Carbon dioxide	.7137
Total solid matter	4.0025
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.0564
Potassium chloride	.2126
Sodium chloride	1.3747
Sodium carbonate	.2032
Calcium carbonate	.9371
Magnesium carbonate	.4143

LAFAYETTE COUNTY.

Oxford.

BRICK CO. WELL.—Depth, 140 feet; water rises about 70 feet; mouth of well about 458 feet above sea level.

SECTION OF BRICK CO. WELL.

	THICKNESS.	DEPTH.
Sand (Lafayette)	70 feet	70 feet.
Clay	25 feet	95 feet.
Sand and water	15 feet	110 feet.
Clay	30 feet	140 feet.

CITY WELL NO. 1.—Depth, 200 feet; water rises 40 feet; mouth of well about 478 feet above sea level.

CITY WELL NO. 2.—Depth, 300 feet; water rises 70 feet; mouth of well about same as above.

SECTION OF WELL NO. 2.

	THICKNESS.	DEPTH.
Clay and sand	90 feet	90 feet.
Dry sand	15 feet	105 feet.
Clay	67 feet	172 feet.
Soapstone (clay)	78 feet	250 feet.
Hard sandstone	50 feet	300 feet.

YALOBUSHA COUNTY.

Water Valley.

There are about a dozen wells in Water Valley flowing at depths varying from 60 to 100 feet; the mouths of the wells are about 294 feet above sea level; there are 20 feet of water-bearing sand under lying from 40 to 80 feet of soil and clay. The sample of water, the analysis of which is given below, was obtained from the town well which has a depth of 100 feet.

ANALYSIS OF WATER FROM WATER VALLEY WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.6937
Oxide of Fe and Al.	.0323
Lime	.1078
Magnesia	.0630
Sulphur trioxide	.0520
Potash	.0563
Soda	.4935
Chlorine	.2517
Carbon dioxide	.3456
Total solid matter	2.0959

Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1042
Sodium sulphate	.0072
Sodium chloride	.4150
Sodium carbonate	.4620
Calcium carbonate	.1925
Magnesium carbonate	.1323

Potability.—The amount of free ammonia in this water is .005 parts and the amount of albuminoids .032 parts per million.

GRENADA COUNTY.

Grenada.

TOWN WELL.—Depth, 620 feet; water flowing; mouth of well about 193 feet above sea level.

SECTION OF GRENADA WELL.

	THICKNESS.	DEPTH.
Surface loam	60 feet	60 feet.
Sand	30 feet	90 feet.
Soapstone (clay)	30 feet	120 feet.
Sand and soft clay	40 feet	160 feet.
Soapstone (clay) with sand	90 feet	250 feet.
Blue sand	30 feet	280 feet.
Soft stone (clay—?)	30 feet	310 feet
Soft blue sandy rock, very fine	140 feet	450 feet.
Soft clay	10 feet	460 feet.
Sand and water	30 feet	490 feet.
Soft blue sandy rock	110 feet	600 feet.
Rock	20 feet	620 feet.

At a depth of 250 feet the water rose within six feet of the surface; at 490 feet the well overflowed.

ANALYSIS OF WATER FROM GRENADA WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	.6480
Oxides of Fe and Al.	.0583
Lime	.2740
Magnesia	.1490
Sulphur trioxide	.0588
Potash	.2990
Soda	13.0115
Chlorine	5.2642
Carbon dioxide	6.4514
Phosphoric acid	.1340
Total solid matter	26.3482

Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.1280
Potassium chloride	.3635
Sodium chloride	8.3908
Sodium carbonate	14.6365
Calcium carbonate	.4893
Magnesium carbonate	.3129

Potability.—The amount of free ammonia is .555 parts to the million and the albuminoids, .069 parts to the million.

DUBARD WELL.—Location, 7 miles west of Grenada, in Yalobusha bottom; water flows 60 gallons per minute; well cased with 2-inch pipe; depth, 210 feet.

SECTION OF DUBARD WELL.

	THICKNESS.	DEPTH.
Clay	10 feet	10 feet.
Quick sand	20 feet	30 feet.
Soapstone	95 feet	125 feet.
Hard rock	.5 feet	125.5 feet.
Water-bearing sand	85 feet	210.5 feet.

WELL SOUTH OF GRENADA 3 MILES.—Depth, 721 feet; water flows one-half gallon per minute; cased with 2-inch pipe; well drilled by T. B. Minyard.

SECTION OF ABOVE WELL.

	THICKNESS.	DEPTH.
Clay	10 feet	10 feet.
Sand	30 feet	40 feet.
Soapstone	30 feet	70 feet.
Sand	10 feet	80 feet.
Soapstone (clay)	10 feet	90 feet.
Mud	20 feet	110 feet.
Soapstone (clay)	10 feet	120 feet.
Very coarse sand	95 feet	215 feet.
Hard rock	.25feet	215.25 feet.
Sand	10 feet	225.25 feet.
Soapstone (clay)	335 feet	560.25 feet.
Two thin rocks	.75feet	561 feet.
Soapstone (clay)	40 feet	601 feet.
Water-bearing sand	63 feet	664 feet.
Soapstone	20 feet	683 feet.
Water-bearing sand	37 feet	721 feet.

Leflore.

M. L. POLLARD WELL.—Depth, 450 (?) feet; water flowing.

ANALYSIS OF WATER FROM POLLARD WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.9124
Oxides of Fe and Al.	.1224
Lime	.9677
Magnesia	.5583
Sulphur trioxide	.0359
Potash	.5287
Soda	3.1799
Chlorine	.3936
Carbon dioxide	3.6120
Total solid matter	11.3103
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.0781
Potassium chloride	.7696
Sodium chloride	.0458
Sodium carbonate	5.3929
Calcium carbonate	1.7283
Magnesium carbonate	1.1724

MONTGOMERY COUNTY.

Winona.

Ice Plant Well.—Depth of well about 300 feet; not flowing; mouth of well about 388 feet above sea level.

Railroad Well.—Depth of well about 300 feet; not flowing; mouth of well about same as above.

ATTALA COUNTY.

Kosciusko.

Town Well.—Depth, 280 feet; water rises to 75 feet of surface; mouth of well about 430 feet above sea level.

SECTION OF TOWN WELL.

	THICKNESS.	DEPTH.
Clay and sand	30 feet	30 feet.
Black clay	10 feet	40 feet.
Black clay and rock	25 feet	65 feet.
Rock, green sand and shells	25 feet	90 feet.
Sand and shells	60 feet	150 feet.
Black dirt (lignite)	5 feet	155 feet.
Gray sand	40 feet	195 feet.

Black clay and gray sand	50 feet	245 feet.
Gray sand, black clay and rock	30 feet	275 feet.
Water-bearing sand	5 feet	280 feet.

Water is found in this well at 35 feet, 75 feet, 195 feet and 275 feet.

CHOCTAW COUNTY.

Ackerman.

CRAMER WELL.—Depth, about 375 feet; water rises within 12 feet of the surface; mouth of the well about 520 feet above sea level.

ANALYSIS OF WATER FROM CRAMER WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	1.6890
Oxides of Fe and Al.	.7870
Lime	.9202
Magnesia	.7897
Sulphur trioxide	.1129
Potash	.3474
Soda	2.4961
Chlorine	.3550
Carbon dioxide	3.2416
Phosphoric acid	.0541
Total solid matter	10.7930
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.2457
Potassium chloride	.3395
Sodium chloride	.3192
Sodium carbonate	3.9768
Calcium carbonate	1.6434
Magnesium carbonate	1.6583

MADISON COUNTY.

Canton.

CITY WELL.—Depth, 1010 feet; water rises 18 feet above the surface; mouth of the well about 224 feet above sea level.

SECTION OF CANTON WELL.

	THICKNESS.	DEPTH.
Surface sand and clay	150 feet	150 feet.
Clay	175 feet	325 feet.
Water-bearing sand	30 feet	355 feet.
Clay	60 feet	415 feet.
Water-bearing sand	30 feet	445 feet.

Calcium sulphate		81.537
Magnesium sulphate		35.656
Aluminum sulphate		61.506
Clay and silt	370 feet	815 feet.
Water-bearing sand	30 feet	845 feet.
Clay and sand	165 feet	1010 feet.

As will be seen from the section, three water-bearing strata occur in this well. The first stratum was reached at a depth of 325 feet and the water rose within six feet of the surface. The second stratum was found at a depth of 415 feet but the water did not rise higher than from the first stratum. At a depth of 815 feet the drill entered the third stratum and the water rose 18 feet above the surface.

ANALYSIS OF WATER FROM THE CANTON WATERWORKS WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	3.2760
Oxide of Fe and Al.	.0667
Lime	.5072
Magnesia	.1511
Sulphur trioxide	.5506
Potash	.2329
Soda	2.9412
Chlorine	.3690
Carbon dioxide	2.2284
Total solid matter	10.3231
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.4321
Sodium chloride	.6084
Sodium sulphate	.6237
Sodium carbonate	4.0101
Calcium carbonate	.9058
Magnesium carbonate	.3173

Way's Bluff.

ALLISON'S MINERAL WELLS.—Location, one mile from Way's Bluff; the water from these wells belong to the Sulphate group of mineral waters. Out of a total of 214.203 grains of solid matter per gallon, 195.813 grains are sulphate.

ANALYSIS OF WATER FROM ALLISON'S WELL.

PROFESSOR W. L. HUTCHINSON, ANALYST.

SUBSTANCE.	GRAINS PER GALLON.
Silica	5.722
Potassium sulphate	1.540
Sodium chloride	10.640
Sodium sulphate	3.135

Iron sulphate	12.439
Iron oxide	2.028
Total solid matter	214.203

Smiths.

A. & V. R. R. WELL.—Depth, 546 feet; water rises within 23 feet of surface; capacity, 113 gallons per minute; mouth of well about 130 above sea level.

SECTION OF A. & V. R. R. WELL.

	THICKNESS.	DEPTH.
Soil and clay	44 feet	44 feet.
Limestone and sandstone	104 feet	148 feet.
Thin strata of hard rock	4 feet	152 feet.
Rock and sand	394 feet	546 feet.

HINDS COUNTY.

Jackson.

CITY WELL.—Located near the bridge across Pearl river; depth, 1175 feet; water flowing; mouth of well about 250 feet above sea level.

The sample of water the analysis of which is given below was obtained from the well at the Baptist Orphan's Asylum.

ANALYSIS OF WATER FROM JACKSON WELL.

SUBSTANCE.	GRAINS PER GALLON.
Silica	2.6060
Oxides of Fe and Al.	.0460
Lime	8.1680
Magnesia	1.9940
Sulphur trioxide	1.5790
Potash	.4520
Soda	1.8240
Chlorine	.7970
Carbon dioxide	8.7562
Total solid matter	26.2222
Sulphuric acid, chlorine and carbon dioxide combined as—	
Potassium sulphate	.8366
Sodium chloride	1.3141
Sodium sulphate	2.1211
Sodium carbonate	.3443
Calcium carbonate	14.5880
Magnesium carbonate	4.1874

Potability.—The water from this well contains .136 parts of free ammonia and .024 parts of albuminoids per million.

Mississippi Agricultural Experiment Station.

BULLETIN No. 90.

THE SAN JOSE SCALE IN MISSISSIPPI, AND THE LIME-SALT-SULPHUR WASH.

By GLENN W. HERRICK.

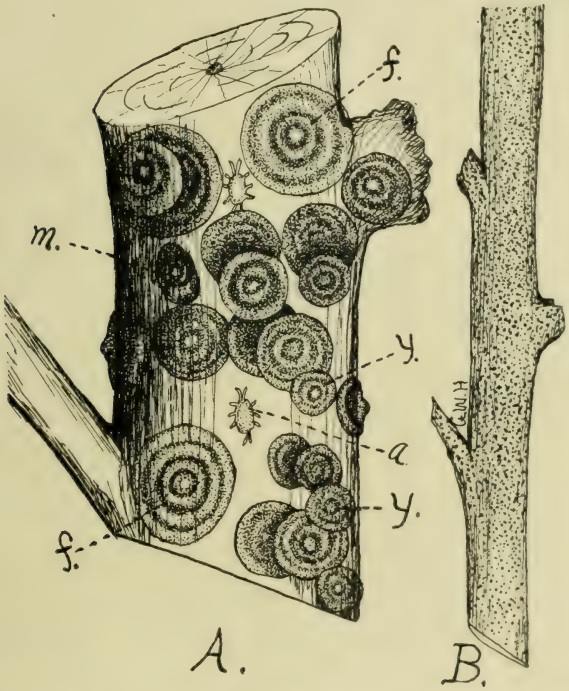

FIG. 1.—A, scales on branch; f, female scale; m, male scale; y, young scales; a, young, unprotected scale insect—all greatly enlarged B, branch showing scales as they appear to the unaided eye.

AGRICULTURAL COLLEGE, MISS.,
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THE SAN JOSÉ SCALE IN MISSISSIPPI,

AND THE LIME-SALT-SULPHUR WASH.

Introduction.—Probably no single insect in the United States has been the subject of more discussion and experimentation than the San José scale (Aspidiotus perniciosus), and small wonder, for there is no insect that is capable of producing greater injury to the fruit interests of our country than this one. As near as can be determined, this insect was introduced into the grounds of Mr. James Lick of San José, California, in the early seventies. It soon spread to adjoining orchards where it was found and first described by Prof. J. H. Comstock in 1880, who quickly recognized its capabilities as an orchard pest, for he named it *perniciosus*, the pernicious scale. By '86 or '87 it had been imported on fruit trees into eastern nurseries and from this time began to spread over the East and South. Mr. Marlatt, of the U. S. Bureau of Entomology, has lately found this insect on native trees in a remote province of China where there seems to have been no introduction of foreign trees or fruit. He, therefore, concludes that the scale must be a native of China and that it has been introduced from that country into this, on imported plants.

The scale in Mississippi.—It is impossible to say when or where this insect first appeared in the State. Prof. H. E. Weed, my predecessor, writes me that he knew of only two points of infestation in the State prior to 1897. One was here at the College and the other at Ocean Springs, Miss. Whether this insect was present in other places at that time I am unable to say, but in my investigations since '97 I have found it widely distributed throughout the State—in Hinds, Lee, Harrison, Lauderdale, Warren, Pike, Sunflower, Jones, Madison, Jefferson, Washington, and other counties. A most significant fact in connection with this distribution is that the introduction of the scale has been definitely traced, in most instances, to nursery stock imported from outside nurseries. It is probably safe to say that this fruit pest will now gradually spread over the whole state and will always have to be reckoned with as one of the liabilities in peach, plum, apple, or pear production.

Description of the insect.—It must be borne in mind that the San José scale is a very small insect, usually smaller than the head of an ordinary pin. Moreover, the female, except for a few hours immediately after birth, lives beneath a hard, waxy scale and consequently is well protected. This scale is circular in outline, slightly conical, and about the size of a small pin-head. The rate of increase is very great and from a single infestation thousands upon thousands of individuals may develop in a season and the tree may become literally covered from the trunk to the outermost branches in two or three years. The young scales are whitish in color, but later they turn dark and are hard to distinguish from the bark. It is difficult to find the scales on a tree at the beginning of an infestation, for they are, of course, few in number and very small; but later, when the insect becomes abundant, the branches assume an ash-gray color and present a scurfy appearance. The females are wingless but the males possess two delicate wings, and when mature crawl out from beneath their scales and fly away.

This insect has its mouth-parts modified into a long, slender beak, which is inserted through the outer bark into the tender tissues of the tree thus enabling the insect to suck the juices from the plant; and, where the scales are in abundance, the tree is greatly weakened or killed outright.

IMMATURE

Life history.—The mature scale insects pass the winter beneath the wax scales. From the middle to the latter part of May, the young are produced in great numbers. They look like small yellow lice, and can be plainly seen with the unaided eye after they issue from beneath the scales and are actively crawling over the bark of the infested plants. Instead of laying eggs the mother insect brings forth her young alive, after which she dies. In a short time after birth the young crawl out from under the old scale and begin scurrying about over the tree in search of places to settle. In a few hours they settle down, insert their beaks through the bark, begin secreting a scale and growing in earnest. Messrs. Lowe and Parrott give 49.5 days as the average period of growth in New York but I believe this period is somewhat shorter here although I have no absolute data on this particular point. If the brood in May, which I have repeatedly seen, is the first brood and a brood appears every fifty days, there are certainly four

broods in this latitude during a season. The last brood in autumn passes the winter in hibernation beneath scales.

Plants liable to infestation.—Peaches, pears, apples, plums, rose, pecan, elm, almond, apricot, maple, chestnut, corn, sugar cane, currant, persimmon, quince, raspberry, gooseberry, osage orange, hawthorne, willow, cherry, etc. are some of the plants affected with the San José scale insect.

Means of distribution.—Since these insects, males excepted, live a fixed life they are distributed entirely by outside agencies. High winds breaking off leaves and blowing them here and there scatter these pests to some extent. The young insects, no doubt, cling to the feet of birds and large insects and are carried from tree to tree. They become attached to the horses, harness, plows, cultivators, etc., used in cultivating the orchard and in this way are carried to other parts of the farm. The foregoing methods of distribution are those occurring over local areas. The spread of this insect from state to state is very largely due to its transportation on fruit or on nursery stock, chiefly the latter. It is well known that pears and apples become infested with the insects and in this way they are shipped to all parts of the country along with the fruit. One can go into the fruit markets of almost any large city and find scale infested fruit. But, without doubt, the main method of distribution of this insect is through the agency of nursery stock,—young trees, scions, buds, etc.—that may be infested with living scales. This is undoubtedly the manner in which the insect came into the United States, and it is the way by which it came into Mississippi. We find it in Vicksburg on trees bought in Florida, in Guntown on trees from a nursery in Georgia, in Ellisville on trees from a nursery in Tennessee, and so it goes everywhere in the state. Mississippi has no law requiring the inspection of nursery stock and the fumigation of the same with hydrocyanic acid gas before entering the state. Such a law should be enacted at once to protect the fruit growers in the future from this insect and other pests and infectious diseases.

Methods and Seasons for combatting this insect.—There are two seasons of the year during which the San José scale may be fought, namely, winter and summer. The more effectual treatment may be given during the winter, but much good may be done by summer treatment at which time the insect can certainly be greatly checked.

We believe the wash known as the lime-salt-sulphur wash is the *ne plus ultra* remedy at present for the San José scale. It has been used for a long time in California and in the dry climate of that state has proved a most efficient wash. It was supposed that in the eastern United States where the precipitation is so much greater the lime-salt-sulphur wash would not be of much value. Indeed, the first trials made seemed to substantiate this idea. Within the last few years, however, the wash has been tried repeatedly under all sorts of conditions and in widely separated localities, and, in nearly every case, has given excellent results.

Work with the lime-salt-sulphur wash in this state.—In the early part of February, 1903, the scale was reported as present in an orchard at Guntown, Miss. On the 18th of February the owner and myself applied the wash to 300 trees. The trees had not been pruned and the wind was blowing hard from the north which made it very difficult to coat the trees on the south side. Moreover it was a cold day with some rain and sleet causing considerable discomfort and making the work unsatisfactory. Unfortunately the trunks of the trees had been treated to a thick coat of whitewash not long before in hope of killing the insects. As we shall see this was a drawback in our results. We used the following formula for the wash:

20 lbs. quick lime.
15 lbs. sulphur
10 lbs. salt
45 gallons of water.

The lime was slacked in three or four gallons of hot water. Before this quit boiling the sulphur was added and enough hot water to make a very thin paste. This was boiled vigorously for two hours. The salt was then added and the whole boiled 45 minutes longer. We used an iron kettle holding ten gallons to boil the mixture in, but had a forty-gallon kettle in which to heat the water. As soon as the wash was sufficiently boiled it was strained through a gunny sack directly into the barrel holding the pump, enough water added to make 45 gallons of mixture and applied while hot. We used a barrel spray pump having two leads of hose, each 20 feet long and fitted with Vermorel nozzles attached to the ends of poles about ten feet long. The barrel was placed in a heavy wagon while the men directing the nozzles remained on the ground. One man ran the pump while another drove the team.

Results of treatment.—I examined the trees on May 26th. Only slight traces of the wash were present. Remember it had been applied in a rain-sleet storm. The insects beneath the old coat of whitewash had been protected from the lime-salt-sulphur wash and served as a means of reinfestation. Never coat scale infested trees with whitewash if you are going to spray to kill the insect. On the parts of the tree not whitewashed I judge 90 per cent. of the scale were killed.

Second treatment.—In the autumn of the same year (Dec. 17) we treated the whole orchard again and in a much more thorough, careful manner. Moreover, we had clear, sunny weather which is nearly always to be had up to Christmas in this state. The mixture was made in exactly the same way and after the same formula and applied in the same manner.

Results.—The owner wrote me in February that the mixture was still on the trees in very good shape. In the early part of April I examined the orchard closely and found that our results were most satisfactory. It seemed to me that we had killed a very large part of the insects and in my notes made at the time, I estimate that over 90 per cent. were dead. In the rush of work on the farm, the owners had not had time to prune the orchard before spraying. As a consequence, we found occasional scales on the tips of the small branches where we could not apply the wash thoroughly. In fact, the tips of limbs cannot be coated, therefore, trees about to be sprayed should be very severely pruned—the tips of all the branches should be cut back and as many branches cut off as can possibly be spared.

Altogether, our experiments with the wash show that the scale may be kept under control in Mississippi by the use of the lime-salt-sulphur mixture.

How to make the wash.—In the first place, only the very best quality of quick lime should be used. In the second place, two iron kettles should be procured, each one holding at least 20 gallons, but the more they hold the better. The 20 pounds of lime should be slacked in three or four gallons of hot water in one of the kettles. When the lime is nearly slacked, but before it quits boiling, add the 15 pounds of sulphur and enough hot water to make a thin paste of the lime and sulphur. Stir the whole vigorously until they are thoroughly mixed, then boil vigorously for 45 minutes. It will be noted that this is a much shorter time than we boiled the mixture in our foregoing work.

Since the experiment at Guntown, rather extensive experiments to determine the length of time the mixture should be boiled to bring about the proper chemical combination between the lime, salt, and sulphur, have been carried out by several Stations. The results of these experiments show that the wash can be made just as effective with a much shorter period of boiling than was formerly supposed to be necessary. This is a very important consideration because the length of time spent in cooking the wash has made it somewhat objectionable heretofore.

After the lime and sulphur have *actually boiled* 45 *minutes*, add the ten pounds of salt, and boil *vigorously* 15 *minutes more*. It will become necessary during the boiling to add a little hot water now and then to keep the mixture thin. When through boiling add enough hot water to make 45 gallons, strain through a gunny sack, and apply hot.

The two kettles, spoken of above, are intended to furnish a cooking outfit for a small orchard, say of a thousand trees. If one has a large orchard and is obliged to make this mixture on a large scale, it will be more economical to buy a boiler of 15 or 20 horse power. A discarded threshing engine that is capable of standing a pressure of 5 or 6 pounds of steam will answer admirably. The boiler should be connected with half a dozen barrels, or more, if desired (fig. 2). Some of the barrels may be used for cooking the wash and some for heating the water. In this way, two or three wagons, each carrying a 45 gallon barrel spray pump, may be kept at work with no loss of time. It will be found most satisfactory to have the barrels mounted on a platform three or four feet high. Of course, the mixture is made in exactly the same manner and in the same proportions as when the kettles are used.

Pumps and nozzles.—There are several pumps that give splendid results with this mixture. The "Pomona" pump, manufactured by the Gould Manufacturing Co., Seneca Falls, N. Y., the "Century" pump, manufactured by the Deming Co., Salem, Ohio, and the "Empire King" pump manufactured by the Field Force Pump Co., Elmira, N. Y., are all good hand power pumps, applicable for use in an orchard of two or three thousand trees. All of these companies, however, manufacture large power spraying outfits, prices of which may be had upon application to them.

It is customary to put a barrel pump in a wagon and draw it around among the trees in this; but we have found it much more

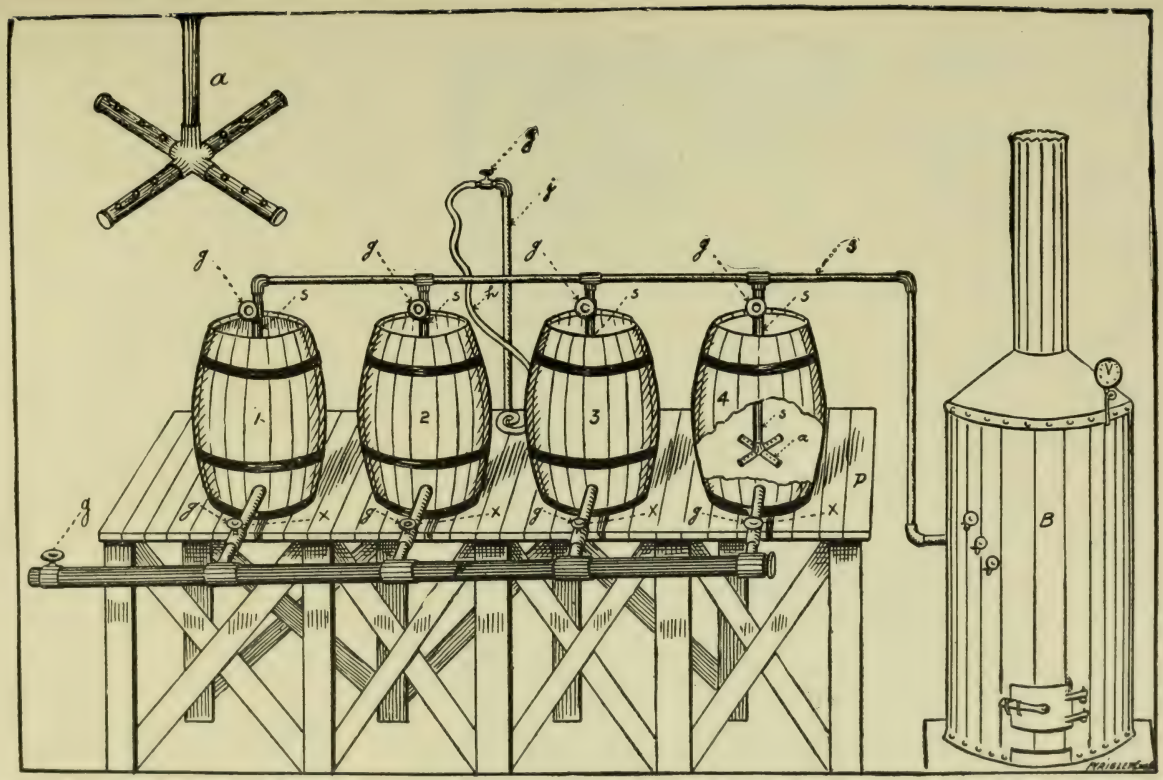

FIG. 2.—An outfit for preparing the lime-salt-sulphur wash; ss, steam pipes; gg, globe valves; 1, 2, 3, and 4, 50 gallon barrels. xx, pipes for drawing off boiled mixture; a, lower end of steam-pipe with cross-arms and one-eighth inch openings for escape of steam. (By courtesy of Newell and Smith, Georgia State Board of Entomology, Bull. 14.)

satisfactory to mount the barrel on a simple drag, or sled. This can be made very cheaply by selecting two saplings of required size, with bowed noses for runners. Then nail short pieces of plank crosswise on the runners, placing the latter about three feet apart. Such an apparatus places the pump low where it can be operated from the

FIG. 3.—Barrel mounted on a drag, or sled. (By courtesy of Dr. W. E. Britton, from Bull. 146, New Haven, Conn.)

ground (fig. 3). In addition, the barrels can be filled from the supply kettles more easily, and finally, the sled can be drawn over rough, uneven, and muddy ground much more easily than can a wagon.

As to nozzles, we have found the Vermorel nozzle with a large opening to give by far the best satisfaction. Each pump ought to have two lines of hose 15 or 20 feet long, each fitted with a Vermorel nozzle. Moreover, it will be found advantageous to have the ends of the hose firmly tied to poles, about ten feet long. This will enable the operator to stand on the ground and reach the remotest parts of the trees.

The liquid should be strained through gunny sacks to remove particles of unslacked lime that otherwise would clog the nozzles.

Precautions to be observed.—Since the lime-salt-sulphur material is a caustic substance, gloves should be worn on the hands and a simple mask made from a piece of cloth with two eyelet holes, should be worn over the face. The horses or mules used in the work should be protected by cheap blankets made from gunny sacks or some like material. Moreover, the pumps, nozzles, and hose should be thoroughly cleaned after use by rinsing them out with two or three changes of water. If this is not done, the wash will corrode the metal parts, weaken the hose, and unfit the whole apparatus for use when needed again.

Pruning.—The orchard should be thoroughly pruned before starting the spray work. The ends of all the branches should be cut back and just as many branches cut off as can be spared. The pruning is an exceedingly important matter and must be done if the best results are to be obtained.

FIG. 4.—A view of the stumps after the orchard was pruned.

In this connection it will be interesting to give an experiment carried out at Guntown. The owners of the infested orchard were not satisfied to hold the scale in check but were anxious to exterminate the pest. To accomplish this, they began in April after the trees had bloomed and were in full leaf, to cut off all the branches, leaving only the bare trunks with the stubs of the larger limbs (fig. 4). After this was finished, they washed the trunks with a strong solution of home-made soap and water and followed this with a thick coat of the lime-salt-sulphur wash applying it with a *paint brush by hand.* I examined these trees on the 21st of the succeeding month of October and could find no scales on the trees, the trunks of which had been treated with the wash by the owners themselves. It is a significant fact that a few scales were found on some of the trees that had been treated by two negroes. These insects were found in the crotches of the large limbs where, evidently, the wash had been carelessly applied or not applied at all. I would emphasize the necessity of skilled and intelligent labor for such work. I believe the San José scale can be exterminated in an orchard by this method. In passing, I might say that the trees made a most remarkable growth and the orchard is practically a new one now.

The following letter from the owner written June 27, 1905, gives in a very clear manner the results of this treatment: "Yours of recent date relative to our 'cut back' trees to hand. In reply, I would say, trees were cut back in April, 1904, after we saw crop was killed. You know how severely they were cut. About 1% of them died, either from the severe cutting or from the treatment, I am unable to say which. They were treated with the lime-salt-sulphur solution, same strength as you use but it was applied with brushes. Where *we* did the work it was a *complete extermination* but where the negroes did it there were a few trees, say 12 to 20, that a scale or two escaped by their not doing the work thoroughly. These trees have made a surprising growth (fig. 5) and, had the crop not been killed this season, would have made one bushel of peaches to the tree."

Time to spray.—It must be remembered that the lime-salt-sulphur wash is a winter remedy only and cannot be applied to the tree when it is in full leaf, unless great care is exercised and it is confined to the trunk and main branches. In such cases it should be applied only by hand. If possible, two applications should be made, one in December after the wood is fully matured, and one in February before the buds start. I believe the best time to apply it is in the month of De-

cember for then we nearly always have the most favorable weather, and if only one application is to be made, by all means do it in the fall. In February we are apt to have so much rain that no opportunity will be found for the work. But, if possible, a second application should be made at this time.

FIG. 5.—Photograph taken in the following November to show the growth of an average tree in one season after the pruning.

Summer treatment.—It often happens that the scale is not discovered in an orchard until late in the spring or in the summer, and by this time it is too late to treat with the lime-salt-sulphur wash. Nevertheless, something should be done at once to hold the pest in check until a more thorough treatment can be given in the winter.

Oil emulsion.—Perhaps the best substance for combatting the scale in summer is an emulsion of kerosene oil and soap which may be made after the following formula:

2 lbs. hard or soft soap.
4 gallons of soft water.
8 gallons of kerosene oil.

Place the soap (if hard soap is used it should be shaved in fine pieces) in the water over a fire and heat until it is thoroughly dissolved. Pour the oil into the barrel in which the spray pump is sitting, and when the water and soap are boiling hot pour them into the barrel with the oil. Pump the mixture vigorously back into itself by directing the hose into the barrel after the cap of the nozzle has been removed. Direct the stream from the hose downward so that all the mass will be agitated. It will probably take ten or fifteen minutes of vigorous pumping to make a creamy, white emulsion. When the emulsion is obtained, add enough water to make 80 gallons of mixture. This will give a ten per cent. solution, which is the only safe one for summer use. When the water is poured into the emulsion it may not mix readily. In this case, direct the hose into the barrel again, and pump back into the mixture as was done at first. If, for any reason, the soap and oil fail to emulsify, the whole batch might as well be thrown away and another attempt made. Care must be taken to use rain water or some soft water.

This emulsion is best applied with the same kind of pumps, nozzles and hose, used in applying the lime-salt-sulphur wash. Moreover, it will be most effective if applied to the trees when the insects are breeding and the young are travelling about on the bark. This will be in May, and every 40 or 50 days thereafter.

Lime-salt-sulphur wash for summer use.—As we have already pointed out, this is a winter wash but it can be used very effectively in the summer also in the following manner: Make it in the same way and according to the same formula as already explained, and, while hot, apply it by hand with a wide brush or mop to the trunks and larger branches or to any portions of the limbs infested with the scale, taking care not to get it on the foliage. By applying this mixture carefully and thoroughly the scale will be greatly checked until a thorough winter treatment may be given.

Summary.

The San José scale is widely distributed in the state and is a serious menace to fruit culture.

There is great danger of obtaining this insect from infested nurseries and every purchaser of fruit trees should demand that his trees be accompanied by a certificate of inspection from a competent entomologist to the effect that they are free from scale, and he should also demand

a sworn statement that his trees have been fumigated with hydrocyanic acid gas.

Winter is the best time to fight the scale. Infested trees should be treated in December after the wood is fully matured and in February, before the buds start, with the lime-salt-sulphur wash.

This wash has given very satisfactory results in this state in holding the insect in check.

The San José scale may be treated in summer with a ten per cent. mixture of kerosene emulsion and also with the lime-salt-sulphur wash. The latter should be applied by hand and only to the trunk branches, and never to the foliage.

We have pretty strong evidence that the scale can be exterminated by cutting the trees back until nothing is left except the stumps which are then treated once or twice to a coat of lime-salt-sulphur wash. This should be applied by hand, very thoroughly and with care. The pruning and treatment should take place, either in the fall or in the spring before the trees come into leaf.

Mississippi Agricultural Experiment Station.

BULLETIN No. 91.

INSPECTION AND ANALYSES OF COMMERCIAL FERTILIZERS

ON SALE IN THE STATE.

CHEMICAL LABORATORY.

AGRICULTURAL COLLEGE, MISS.,

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MISSISSIPPI FERTILIZER CONTROL.

INSPECTION AND ANALYSES OF FERTILIZERS

BY THE CHEMICAL DEPARTMENT OF THE

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INSPECTION AND ANALYSES OF COMMERCIAL FERTILIZERS

ON SALE IN THE STATE.

Introduction.—The following tables of analyses summarize the results of the inspection of commercial fertilizers for the season of 1904-1905. This is the fourth publication of analyses of samples drawn during the season, and farmers and dealers have had an opportunity of keeping themselves accurately informed in regard to the composition of all goods placed on the Mississippi markets.

Inspectors are placed on the road as soon as fertilizers begin to move, and an active inspection is maintained throughout the business season. Every care is taken in drawing samples, that the analyses made and published from time to time may represent as accurately as possible the composition of the goods sold under the various brand names.

Purchasers and manufacturers receive copies of the analyses prior to their publication in the regular circulars issued by the Department. This procedure enables the dealer as well as the manufacturer to take prompt action whenever irregularities are brought to light by the analytical results.

Results of the Inspection.—A study of the tabulated results which follow in table II will bring out the facts that 8.77 per cent. of all samples analyzed during the season are below the guarantee of the manufacturer in one or more of the essential elements and also in the relative commercial value calculated from the analyses. It is gratifying to note, however, that the percentage of samples found deficient in the calculated values shows a decrease when compared with the results for the past two seasons. The following table will illustrate this:

	Number of Samples Analyzed	Number found below guarantee in Relative Value	Percentage found below guarantee in Relative Value
Season of 1902-1903	262	28	10.68
Season of 1903-1904	280	42	15.00
Season of 1904-1905	399	35	8.77

It should be stated that the deficiency shown by a few of the analyses is not very great, since we find only 5.26 per cent. of the samples analyzed as much as 3.00 per cent. below the manufacturer's guarantee in relative value.

For the convenience of those interested in the fertilizer trade, the general results of the inspections are summarized in table 1, and this condensed review of the analyses of samples of the various brands found on our markets is commended to the attention of those who intend to purchase goods during the coming season.

Uniform Mixing.—In view of the variation in composition of the raw material at the disposal of the fertilizer manufacturer, it is too much to expect all samples to exhibit an absolute uniformity when analyzed. It cannot be denied, however, that departures from the guaranteed analyses should be held within reasonably narrow limits. It would appear that it is practically always possible to preserve the essential nature of the brand. This has not been done in every case, though it may be remarked that most manufacturers do make an effort to mix their goods in accordance with the guarantees. In general, a deficiency in one ingredient of the mixture should be accompanied by a corresponding increase in another; but, as already stated, the specific character of the brand should be preserved always.

Table I will show that the average shortage in available phosphoric acid and in potash is not very great, yet we find that 16.29 per cent. of all samples are as much or more than 8.00 per cent. below the guarantee in nitrogen. It is not unfair, therefore, for farmers to expect an improvement in this respect during the next season, and it is hoped that this matter will receive from our manufacturers the careful attention which it deserves.

Complete Fertilizers.—It is well known that complete fertilizers are those carrying nitrogen, available phosphoric acid, and potash. The desire on the part of some to buy or to sell a so-called complete

fertilizer at a lower price than that asked for the standard brands has led to the manufacture of a grade of goods that contains a comparatively small percentage of nitrogen and potash. A mixture of this kind can be sold for a lower price, but it appears safe to say that it is a kind of false economy to buy them at all. **If a farmer needs a complete fertilizer, he should see that it is guaranteed to contain not less than 1.65 to 2.00 per cent. of nitrogen and also not less than that amount of potash. It is more economical to purchase an acid phosphate at once than to pay for the small amount of nitrogen and potash contained in the low grade fertilizer. The cost per pound of plant food in the high grade goods should be smaller than in the inferior mixtures.**

Guaranteed Analyses and Analyses of Official Samples.—All brands registered for sale in MISSISSIPPI during the season, together with the analyses of the official samples of them and also their guarantees, will be found in table III of this bulletin.

Every bag of fertilizer sold in this State should be plainly stamped as follows:

(1) The name and grade of the brand.
(2) Name and address of the manufacturer.
(3) Guarantee of Water-soluble phosphoric acid.
(4) Guarantee of Citrate-soluble (or reverted) phosphoric acid.
(5) Guarantee of Available phosphoric acid.
(6) Guarantee of Insoluble phosphoric acid.
(7) Guarantee of Nitrogen.
(8) Guarantee of Potash.

Calculation of relative commercial values—schedule of prices.—The following schedule of prices is used in calculating relative commercial values for this season:

	per lb.	per unit.
For Nitrogen	17½c	$3.50
For Water-Soluble Phosphoric Acid in mixed goods	6c	1.20
For Citrate-Soluble Phosphoric Acid in mixed goods	5½c	1.1C
For Water-Soluble Phosphoric Acid in plain Acid Phosphate	5½c	1.10
For Citrate-Soluble Phosphoric Acid in plain Acid Phosphate	5c	1.00
For Total Phosphoric Acid in fine bone	3c	.60
For Total Phosphoric Acid in medium and coarse bone	2½c	.50
For Potash	5c	1.00

TABLE I—SUMMARY OF RESULTS IN TABLE II.

Name and Address of Manufacturer.	Number of Samples Analyzed.	Number of Samples equal to or above guarantee in Available Phosphoric Acid, Nitrogen, and Potash.	Number of Samples found as much as five per cent. below guarantee in Available Phosphoric Acid.	Number of Samples found as much as eight per cent. below guarantee in Nitrogen.	Number of Samples found as much as eight per cent. below guarantee in Potash.	Number of Samples found as much as three per cent. below guarantee in Relative Commercial Value.	Number of Samples found to be equal to or above guarantee in Relative Commercial Value.
Alabama Chemical Company, Montgomery, Ala.	4	1	0	1	0	0	3
American Guano Company, Nashville, Tenn.	4	1	0	2	0	0	4
Armour Fertilizer Works, Atlanta, Ga.	2	1	0	1	1	0	2
Birmingham Fertilizer Company, Birmingham, Ala.	2	0	0	2	0	0	2
Sold by Blumenfeld & Fried, Ackerman, Miss.	1	0	1	0	0	1	0
Brookhaven Progressive Cotton Oil Company, Brookhaven, Miss.	6	3	0	1	0	0	6
Capital Fertilizer & M'f'g. Company, Jackson, Miss.	24	12	0	7	0	0	24
Continental Fertilizer Company, Nashville, Tenn.	1	1	0	0	0	0	1
Crystal Springs Oil Mill, Fertilizer & M'f'g. Co., Crystal Springs, Miss.	7	5	1	0	0	0	7
Eagle Cotton Oil Company, Meridian, Miss.	6	2	1	1	0	2	4
Federal Chemical Company, Louisville, Ky.	5	3	0	0	0	0	5
Gulfport Cotton Oil Fertilizer & M'f'g. Co., Gulfport, Miss.	6	1	3	2	0	4	1
Hazlehurst Oil Mill & Fertilizer Co., Hazlehurst, Miss.	10	8	2	0	0	0	10
Jackson Fertilizer Company, Jackson, Miss.	37	18	0	7	0	0	37
Kosciusko Oil Mill & Fertilizer Co., Kosciusko, Miss.	7	4	0	0	0	0	7

Laurel Oil & Fertilizer Co., Laurel, Miss.	18	6	2	1	0	1	17
Meridian Fertilizer Factory, Meridian, Miss.	81	45	11	10	2	9	70
New Orleans Acid & Fertilizer Co., New Orleans, La.	26	20	0	3	0	0	26
Newton Oil & M'f.g' Co., Newton, Miss.	7	1	0	1	0	1	5
Planters' Fertilizer & Chemical Co., New Orleans, La.	9	3	0	3	0	0	9
Refuge Cotton Oil Co., Columbus, Miss.	4	3	0	1	0	0	4
Shubuta Oil & M'f'g. Co., Shubuta, Miss.	6	4	0	1	0	0	5
Southern Oil & Fertilizer Co., Meridian, Miss.	8	7	0	0	0	0	8
Standard Guano & Chemical M'f'g. Co., New Orleans, La.	51	19	3	15	2	1	47
Swift Fertilizer Works, Atlanta, Ga.	6	4	0	1	0	0	6
Tennessee Chemical Co., Nashville, Tenn.	2	2	0	0	0	0	2
Tennessee Valley Fertilizer Co., Florence, Ala.	6	2	1	2	0	1	3
Sold by Threefoot Bros. & Co., Meridian, Miss.	6	5	1	0	0	1	5
Virginia-Carolina Chemical Co., Memphis, Tenn.	45	32	0	3	0	0	42
Wesson Cotton Oil & Fertilizer Co., Wesson, Miss.	2	1	0	0	0	0	2
Totals	399	214	26	65	5	21	364
Percentages		53.63	6.51	16.29	1.25	5.26	91.23

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
	ALABAMA CHEMICAL CO., Montgomery, Ala.	
4364	H. G. Rex Dissolved Bone	W. J. Hubbard, Shuqualak
		Guarantee
4363	S. G. Big Boll Guano	W. J. Hubbard, Shuqualak
4558	S. G. Big Boll Guano	M. H. Clayton & Co., Heidelberg
4559	S. G. Big Boll Guano	T. D. Rees & Co., Booneville
		Average
		Guarantee
	AMERICAN GUANO CO., Nashville, Tenn.	
4378	S. G. Mule Brand Bourland's Cotton Grower	W. L. Bourland, Amory
		Guarantee
4242	S. G. Mule Brand Cotton, Corn, and Wheat Guano	W. A. Turner & Co., Forest
4560	S. G. Mule Brand Cotton, Corn, and Wheat Guano	M. E. Philips & Co., Eupora
		Average
		Guarantee
4137	S. G. Mule Brand Gaston's Choice	A. J. Gaston, Ackerman
		Guarantee
	ARMOUR FERTIL'ER WORKS, Atlanta, Ga.	
4289	Shield Brand S. G. King Cot.	Lott Bros., Seminary
4561	Shield Brand S. G. King Cot.	Ridgeland Gin & Supply Co., Ridgeland
		Average
		Guarantee
	B'MINGHAM FERTILIZER CO., Birmingham, Ala.	
4379	Birmingham S. G. Fertilizer	Gilmore, May & Co., Amory
4562	Birmingham S. G. Fertilizer	J. A. Taylor & Son, Pelahatchie
		Average
		Guarantee
	Sold by BLUMENFELD & FRIED Ackerman, Miss.	
4380	S. G. Blumenfeld & Fried's Own Mixture	Blumenfeld & Fried, Ackerman
		Guarantee
	BROOKHAVEN PROGRESSIVE COTTON OIL CO., Brookhaven, Miss.	
4563	H. G. B'haven Special Mix.	Louis Cohn & Bros., Brookhaven
4564	H. G. B'haven Special Mix.	Louis Cohn & Bros., Brookhaven
		Average
		Guarantee
4565	H. G. Hutchison's Formula	A. L. Hutchison & Co., Crystal Springs
4566	H. G. Hutchison's Formula	A. L. Hutchison & Co., Crystal Springs
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4364	10.78	11.47	2.22	13.69	1.41			14.84
		11.00	*3.00*	*14.00*	*2.00*			*15.10*
4363	11.87	7.93	2.03	9.96	1.09	1.08	3.34	18.87
4558	13.45	7.90	2.97	10.87	.49	.92	3.37	19.34
4559	14.35	8.29	2.78	11.07	.51	.69	3.34	18.76
	13.22	**8.04**	**2.59**	**10.63**	**.69**	**.90**	**3.35**	**18.99**
		8.00	*2.00*	*10.00*	*2.00*	*.82*	*3.00*	*17.67*
4378	11.36	7.29	2.58	9.87	2.11	1.76	3.89	21.64
		5.00	*3.00*	*8.00*	*1.00*	*1.65*	*3.00*	*18.07*
4242	12.40	4.84	3.41	8.25	2.87	1.51	2.98	17.82
4560	12.07	6.35	3.11	9.46	2.06	1.45	2.60	18.72
	12.23	**5.60**	**3.25**	**8.86**	**2.47**	**1.48**	**2.78**	**18.27**
		5.00	*3.00*	*8 00*	*1.00*	*1.65*	*2.00*	*17.07*
4137	11.12	3.86	4.01	7.87	2.31	1.69	2.86	17.82
		5.00	*3.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.07*
4289	10.77	5.17	3.81	8.98	4.02	1.50	1.67	17.32
4561	11.05	6.20	3.61	9.81	.81	1.73	2.39	19.86
	10.91	**5.68**	**3.71**	**9.39**	**2.41**	**1.62**	**2.03**	**18.59**
		7.00	*1.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.28*
4379	11.08	8.29	3.81	12.10	1.39	1.49	3.09	22.44
4562	11.85	8.29	1.72	10.01	1.57	1.49	2.29	19.35
	11.46	**8.29**	**2.77**	**11.06**	**1 48**	**1.49**	**2.69**	**20.90**
		6.00	*2.00*	*8.00*	*2.00*	*1.64*	*2.00*	*17.14*
4380	13.44	5.42	2.78	8.20	.97	1.77	1.71	17.47
		8.00	*1.50*	*9.50*	*1.00*	*1.64*	*1.50*	*18.49*
4563	12.31	8.12	2.23	10.35	1.04	1.40	3.00	20.10
4564	10.75	5.85	4.38	10.23	.79	1.56	3.10	20.40
	11.53	**6.98**	**3.31**	**10.29**	**.91**	**1.48**	**3.05**	**20.25**
		7.00	*3.00*	*10.00*	*1.00*	*1.65*	*2.00*	*19.48*
4565	7.51	4.43	2.86	7.29	.86	2.92	5.07	23.75
4566	6.59	4.11	3.26	7.37	.59	3.02	5.15	24.24
	7.05	**4.27**	**3.06**	**7.33**	**.72**	**2.97**	**5.11**	**24.00**
		5.00	*2.00*	*7.00*	*1.00*	*3.00*	*4.00*	*22.70*

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
4138	S. G. New South	Louis Cohn & Bros., Brookhaven
4243	S. G. New South	Louis Cohn & Bros., Brookhaven
		Average
		Guarantee
	CAPITAL FER'T. & MFG. CO., Jackson, Miss.	
4381	H. G. Acid Phosphate	J. W. Ray, Canton
4569	H. G. Acid Phosphate	W. C. Wilkinson & Co., Crystal Springs
		Average
		Guarantee
4139	S. G. Acid Phosphate	Kelly & Wood, Kosciusko
4290	S. G. Acid Phosphate	R. C. Cooper, Morton
4478	S. G. Acid Phosphate	T. S. Turner, Canton
4567	S. G. Acid Phosphate	J. L. Moyse & Bro., Summit
4568	S. G. Acid Phosphate	W. C. Ellis Mercantile Co., Hebron
		Average
		Guarantee
4382	S. G. Cotton Elevator	W. W. Loftis, Steenston
4570	S. G. Cotton Elevator	L. C. Philips, Eupora
		Average
		Guarantee
4291	S. G. Mississippi Guano	Capital Fert. & M'f'g. Co., Jackson
		Guarantee
4140	S. G. Nonpariel	Kelly & Wood, Kosciusko
4244	S. G. Nonpariel	McComb City Mer. Co., McComb City
4292	S. G. Nonpariel	R. C. Cooper, Morton
4329	S. G. Nonpariel	Fountain-Mimms Co., Ellisville
4383	S. G. Nonpariel	Kelly & Wood, Kosciusko
4543	S. G. Nonpariel	C. G. Miller, Natchez
4571	S. G. Nonpariel	W. H. Gallaspy, Hickory
4572	S. G. Nonpariel	Lann & Carter H'd'w. Co., Aberdeen
4573	S. G. Nonpariel	Gayden & Co., Brandon
		Average
		Guarantee
4141	S. G. Red Star Brand	J. W. Ray, Canton
4172	S. G. Red Star Brand	S. Alcus, Summit
4574	S. G. Red Star Brand	W. P. Mangum, Braxton
		Average
		Guarantee
4293	H. G. Vegetable Grower	A. L. Hutchison & Co., Crystal Springs
4575	H. G. Vegetable Grower	Kemp & Abrams, Hazlehurst
		Average
		Guarantee
	CONTINENTAL FERTIL'ER CO., Nashville, Tenn.	
4384	S.G.Sunny South Acid Phos.	Myers & Mehaffy, Steenston
		Guarantee
	CRYSTAL SPRINGS OIL MILL FERT. & M'F'G. CO., Crystal Springs, Miss.	
4245	S. G. Crystal Star	Lotterhos & Huber, Crystal Springs

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4138	9.73	7.56	3.57	11.13	1.56	1.71	2.02	21.00
4243	8.64	7.91	2.70	10.61	1.30	1.76	3.07	21.69
	9.18	**7.74**	**3.13**	**10.87**	**1.43**	**1.74**	**2.54**	**21.35**
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*1.80*	*18.18*
4381	12.77	11.69	2.69	14.38	1.11			15.55
4569	13.24	10.53	3.84	14.37	1.07			15.42
	13.00	**11.11**	**3.27**	**14.38**	**1.09**			**15.49**
		10.00	*4.00*	*14.00*	*1.00*			*15.00*
4139	13.71	10.90	3.82	14.72	1.82			15.81
4290	12.42	9.45	3.74	13.19	1.15			14.14
4478	12.42	10.16	2.85	13.01	1.69			14.03
4567	12.10	10.32	3.83	14.15	1.19			15.18
4568	12.82	10.76	3.40	14.16	1.10			15.24
	13.69	**10.32**	**3.53**	**13.85**	**1.39**			**14.88**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
4382	11.07	7.10	2.64	9.74	.78	1.44	2.68	19.14
4570	12.74	6.56	2.80	9.36	1.07	1.37	2.70	18.45
	11.90	**6.83**	**2.72**	**9.55**	**.92**	**1.41**	**2.69**	**18.80**
		6.50	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*17.23*
4291	11.29	7.18	2.53	9.71	.55	1.66	2.58	19.79
		6.50	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*17.23*
4140	10.80	6.90	2.44	9.34	1.26	1.62	2.39	19.02
4244	9.24	6.90	2.62	9.52	1.36	1.61	2.84	19.64
4292	10.95	6.68	2.58	9.26	1.05	1.67	2.51	19.21
4329	10.55	6.82	2.34	9.16	.70	1.86	2.80	20.07
4383	12.22	6.50	2.55	9.05	1.09	1.58	2.70	18.84
4543	10.54	7.00	2.46	9.46	.82	1.54	2.36	18.86
4571	11.83	6.60	3.01	9.61	.82	1.32	2.66	18.51
4572	11.39	6.73	3.09	9.82	.74	1.48	2.64	19.30
4573	11.23	7.11	2.93	10.04	.77	1.45	2.74	19.57
	10.97	**6.80**	**2.67**	**9.47**	**.96**	**1.57**	**2.63**	**19.22**
		6.50	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*17.23*
4141	10.93	7.21	2.44	9.65	1.25	1.49	2.25	18.80
4172	11.27	7.18	2.49	9.67	1.22	1.68	2.51	19.75
4574	11.22	7.70	2.50	10.20	.47	1.60	2.85	20.44
	11.14	**7.36**	**2.47**	**9.84**	**.98**	**1.59**	**2.54**	**19.66**
		6.50	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*17.23*
4293	9.02	5.13	2.40	7.53	.60	2.66	5.55	23.66
4575	9.94	5.92	2.73	8.65	.38	2.06	6.46	23.78
	9.48	**5.53**	**2.56**	**8.09**	**.49**	**2.36**	**6.00**	**23.72**
		5.00	*2.00*	*7.00*	*1.00*	*2.50*	*4.00*	*20.95*
4384	12.98	9.38	4.13	13.51	.54			14.45
		8.00	*5.00*	*13.00*	*1.00*			*13.80*
4245	10.99	7.04	3.66	10.70	.38	1.95	2.86	22.16

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
4576	S. G. Crystal Star	Alford & Miller, Gallman
4577	S. G. Crystal Star	Lotterhos & Huber, Crystal Springs
		Average
		Guarantee
4385	S. G. Lotterhos & Huber's Cotton Fertilizer	Lotterhos & Huber, Crystal Springs
4578	S. G. Lotterhos & Huber's Cotton Fertilizer	Lotterhos & Huber, Crystal Springs
		Average
		Guarantee
4386	H. G. L. & H.'s Veg. Fert.	Lotterhos & Huber, Crystal Springs
		Guarantee
4579	H. G. Crystal Veg. Grower	Alford & Miller, Gallman
		Guarantee
	EAGLE COTTON OIL CO., Meridian, Miss.	
4516	Eagle H. G. Acid Phosphate	McLeod & Co., Purvis
4538	Eagle H. G. Acid Phosphate	R. W. Fagan & Co., Waynesboro
4539	Eagle H. G. Acid Phosphate	Davis & Buffkin, Buckatunna
		Average
		Guarantee
4294	S. G. Farm Mixture	Howie Bros., Morton
4580	S. G. Farm Mixture	C. T. Bonney, Enterprise
4581	S. G. Farm Mixture	J. N. Shirley, DeSoto
		Average
		Guarantee
	FEDERAL CHEMICAL CO., Louisville, Ky. MARKS & GAYLE, Div. M'grs. Montgomery, Ala.	
4246	Daybreak H. G. Acid Phos	W. A. Turner & Co., Forest
		Guarantee
4476	Daybreak H. G. Acid Phosphate No. 2	H. A. James, Heidelberg
		Guarantee
4247	S. G. Daybreak Fertilizer	W. A. Turner & Co., Forest
4582	S. G. Daybreak Fertilizer	L. M. Philips & Co., Booneville
4583	S. G. Daybreak Fertilizer	J. K. Kirkland, Quitman
		Average
		Guarantee
	GULFPORT COTTON OIL, FERT. & M'F'G. CO., Gulfport, Miss.	
4477	H. G. Primo Acid Phos	T. S. Turner, Canton
4584	H. G. Primo Acid Phos	N. R. Hosey, Soso
4585	H. G. Primo Acid Phos	W. Atkinson & Bacot Co., Osyka
		Average
		Guarantee
4330	S. G. Primo Cottonseed Meal Compound	Williams Bros., Sumrall

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4576	13.64	6.21	2.42	8.63	.90	1.76	3.78	20.05
4577	9.59	6.55	3.14	9.69	.88	1.96	3.48	21.65
	11.41	**6.60**	**3.07**	**9.67**	**.72**	**1.89**	**3.37**	**21.26**
		7.00	*2.50*	*9.50*	*1.00*	*1.70*	*1.90*	*19.00*
4385	10.64	5.32	2.91	8.23	.99	2.07	3.15	19.98
4578	11.31	6.75	2.42	9.17	.52	1.79	3.32	20.35
	10.97	**6.04**	**2.66**	**8.70**	**.75**	**1.93**	**3.24**	**20.17**
		6.50	*1.50*	*8.00*	*.50*	*1.75*	*2.00*	*17.58*
4386	8.35	4.55	2.91	7.46	.68	3.21	6.32	26.22
		4.00	*1.00*	*5.00*	*.60*	*3.00*	*5.00*	*21.40*
4579	9.90	4.32	2.94	7.26	.38	2.79	5.39	23.57
		3.00	*3.00*	*6.00*	*1.00*	*3.00*	*4.00*	*21.40*
4516	12.39	12.28	1.16	13.44	1.74			14.67
4538	12.17	10.21	2.59	12.80	2.15			13.82
4539	12.87	11.45	3.53	14.98	.94			16.13
	12.47	**11.31**	**2.43**	**13.74**	**1.61**			**14.87**
		11.50	*2.50*	*14.00*	*1.50*			*15.15*
4294	11.43	6.51	2.70	9.21	.50	1.50	2.52	18.55
4580	10.94	5.69	2.03	7.72	.60	2.02	3.54	19.67
4581	11.43	6.06	2.89	8.95	.73	1.67	2.41	18.71
	11.26	**6.09**	**2.54**	**8.63**	**.61**	**1.73**	**2.82**	**18.98**
		6.00	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.18*
4246	11.59	10.78	3.65	14.43	.69			15.51
		10.00	*4.00*	*14.00*	*1.00*			*15.00*
4476	14.47	12.14	5.48	17.62	.50			18.49
		10.67	*5.33*	*16.00*	*1.00*			*17.07*
4247	11.26	5.54	3.54	9.08	.46	1.93	2.26	19.56
4582	8.04	5.34	2.60	7.94	1.64	1.60	2.53	17.40
4583	7.44	4.89	3.48	8.37	2.46	1.60	2.79	18.09
	8.91	**5.26**	**3.21**	**8.47**	**1.52**	**1.71**	**2.53**	**18.35**
		5.33	*2.67*	*8.00*	*1.00*	*1.65*	*2.00*	*17.11*
4477	14.20	10.27	4.92	15.19	.78			16.22
4584	13.32	9.08	6.20	15.28	.48			16.19
4585	14.06	9.82	5.20	15.02	.92			16.00
	13.86	**9.73**	**5.44**	**15.17**	**.72**			**16.14**
		14.00	*2.00*	*16.00*	*1.00*			*17.40*
4330	9.75	5.26	3.21	8.47	.55	1.68	2.56	18.28

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
4586	S. G. Primo Cottonseed Meal Compound	A. K. Kennedy, Weathersby
4587	S. G. Primo Cottonseed Meal Compound	M. H. Clayton & Co., Heidelberg
		Average
		Guarantee
	Hazlehurst Oil Mill & Fertilizer Co., Hazlehurst, Miss.	
4143	H. G. Acid Phosphate	Hazlehurst Oil Mill & Fert. Co., H'hurst
4248	H. G. Acid Phosphate	J. R. Gillaspy, Crystal Springs
4588	H. G. Acid Phosphate	Pickens Cotton Oil Co., Pickens
		Average
		Guarantee
4249	S. G. Imperial Fertilizer	J. R. Gillaspy, Crystal Springs
4589	S. G. Imperial Fertilizer	W. L. Robinson & Co., Liberty
4590	S. G. Imperial Fertilizer	Hyman Mercantile Co., Summit
		Average
		Guarantee
4387	H. G. Imp. Veg. Grower	J. R. Gillaspy, Crystal Springs
4591	H. G. Imp. Veg. Grower	J. C. Harvey, Gallman
		Average
		Guarantee
4144	S. G. German Kainit	H'hurst Oil Mill & Fert. Co., Hazlehurst
4592	S. G. German Kainit	W. L. Robinson & Co., Liberty
		Average
		Guarantee
	Jackson Fertilizer Co., Jackson, Miss.	
4250	H. G. Acid Phosphate	Lotterhos & Huber, Crystal Springs
4331	H. G. Acid Phosphate	F. L. Riley Mercantile Co., New Hebron
4388	H. G. Acid Phosphate	The Mississippi Co., Canton
4593	H. G. Acid Phosphate	I. N. Varnado, Osyka
4594	H. G. Acid Phosphate	T. M. Heidelberg & Son, Heidelberg
4595	H. G. Acid Phosphate	Johnson & Woodward, Mt. Olive
		Average
		Guarantee
4295	S. G. Black Hawk Acid Phos	J. A. Spann & Co., Pelahatchie
4596	S. G. Black Hawk Acid Phos.	The Lampton Mer. Co., Magnolia
4597	S. G. Black Hawk Acid Phos.	E. M. Carter & Co., Centreville
4598	S. G. Black Hawk Acid Phos.	Buckley Bros., Enterprise
		Average
		Guarantee
4599	S. G. Chicago R. B. Superphosphate	F. L. Riley Mer. Co., Hebron
4600	S. G. Chicago R. B. Superphosphate	J. W. Grantham & Co., Terry
		Average
		Guarantee
4261	S. G. Lampton's Am. R. B. Superphosphate	The Lampton Co., Columbia

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4586	9.17	4.87	2.28	7.15	.36	1.48	2.84	16.37
4587	9.59	5.48	2.99	8.47	.29	1.33	2.62	17.14
	9.50	**5.20**	**2.83**	**8.03**	**.60**	**1.53**	**2.67**	**17.27**
		6.00	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.18*
4143	11.73	11.85	4.11	15.96	2.56			17.15
4248	13.48	11.83	4.85	16.68	.69			17.86
4588	11.45	12.50	2.12	14.62	1.23			15.87
	13.33	**12.06**	**3.69**	**15.75**	**1.49**			**16.96**
		12.00	*2.00*	*14.00*	*2.00*			*15.20*
4249	11.16	7.47	3.60	11.07	.58	1.94	2.43	22.14
4589	10.74	7.24	3.13	10.37	.81	1.87	2.66	21.34
4590	10.16	7.06	3.75	10.81	.79	1.70	2.62	21.17
	10.69	**7.26**	**3.49**	**10.75**	**.73**	**1.84**	**2.57**	**21.55**
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*2.00*	*18.38*
4387	7.30	3.18	2.56	5.74	.37	3.45	4.85	23.56
4591	7.27	3.57	2.69	6.26	.51	3.09	4.14	22.20
	7.29	**3.38**	**2.62**	**6.00**	**.44**	**3.27**	**4.49**	**22.88**
		5.00	*2.00*	*7.00*	*1.00*	*2.50*	*3.00*	*19.95*
4144	1.55						12.54	12.54
4592	2.16						13.62	13.62
	1.86						**13.08**	**13.08**
							12.00	*12.00*
4250	12.51	12.21	3.94	16.15	1.70			17.37
4331	11.81	13.09	1.84	14.93	1.51			16.24
4388	12.11	11.45	4.13	15.58	.68			16.73
4593	10.85	9.66	5.65	15.31	.67			16.28
4594	10.01	10.44	5.04	15.48	.61			16.52
4595	6.72	10.35	5.08	15.43	.45			16.47
	10.67	**11.20**	**4.28**	**15.48**	**.94**			**16.60**
		12.00	*2.00*	*14.00*	*1.00*			*15.20*
4295	9.78	8.90	5.54	14.44	1.25			15.33
4596	9.51	9.53	4.33	13.86	1.61			14.81
4597	12.94	10.00	4.76	14.76	1.69			15.76
4598	8.40	9.22	4.84	14.06	1.66			14.98
	10.16	**9.41**	**4.87**	**14.28**	**1.55**			**15.22**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
4599	8.95	6.28	4.13	10.41	3.03	1.68	1.92	19.88
4600	8.68	6.63	4.09	10.72	2.23	1.57	1.81	19.76
	8.81	**6.45**	**4.11**	**10.56**	**2.63**	**1.63**	**1.87**	**19.82**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.50*	*18.48*
4261	8.69	7.66	3.24	10.90	2.12	1.60	1.76	20.12

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
4601	S. G. Lampton's Am. R. B. Superphosphate	Rawls & Lampton, Silver Creek
		Average
		Guarantee
4602	H. G. L. & H's. Special Fert.	Lotterhos & Huber, Crystal Springs
4603	H. G. L. & H.'s Special Fert.	Lotterhos & Huber, Crystal Springs
		Average
		Guarantee
4145	S. G. Royal "C" Brand	Lotterhos & Huber, Crystal Springs
4146	S. G. Royal "C" Brand	Myer Mercantile Co., Taylorsville
4173	S. G. Royal "C" Brand	Lampton-Rawls Co., Mt. Olive
4174	S. G. Royal "C" Brand	C. Atkinson Son's Co., Summit
4175	S. G. Royal "C" Brand	The Lampton Co., Columbia
4251	S. G. Royal "C" Brand	Story & Co., Forest
4262	S. G. Royal "C" Brand	J. P. Myer, Ellisville
4263	S. G. Royal "C" Brand	The Lampton Co., Columbia
4296	S. G. Royal "C" Brand	Gaddis & Slay Co., Magee
4332	S. G. Royal "C" Brand	S. S. Dale & Sons, Prentiss
4333	S. G. Royal "C" Brand	F. L. Riley Mercantile Co., New Hebron
4334	S. G. Royal "C" Brand	Walker Durr & Co., Pinola
4389	S. G. Royal "C" Brand	The Mississippi Co., Canton
4604	S. G. Royal "C" Brand	J. W. McKay, Buckatunna
4605	S. G. Royal "C" Brand	H. A. Busick, Brandon
4606	S. G. Royal "C" Brand	A. C. Seavey & Sons, Brookhaven
4607	S. G. Royal "C" Brand	R. F. Everett, Braxton
4608	S. G. Royal "C" Brand	O. W. Conner & Co., Seminary
4609	S. G. Royal "C" Brand	Buckley Bros., Enterprise
4610	S. G. Royal "C" Brand	Barney, Johns & Co., Gloster
4611	S. G. Royal "C" Brand	Hickman, Son, Butler & Co., M'ticello
		Average
		Guarantee
	Kosciusko Oil Mill & Fertilizer Co., Kosciusko, Miss.	
4190	H. G. Acid Phosphate	K'sko Oil Mill & Fert. Co., Kosciusko
4612	H. G. Acid Phosphate	Seward & Co., Ackerman
		Average
		Guarantee
4191	S. G. Peerless Guano	Kosciusko Oil Mill & Fert. Co., K'sko
4390	S. G. Peerless Guano	J. B. Triplett, McCool
4613	S. G. Peerless Guano	G. Lowenberg & Co., Kosciusko
4614	S. G. Peerless Guano	F. Z. Jackson & Son, Kosciusko
4615	S. G. Peerless Guano	J. W. S. Guyton, Sallis
		Average
		Guarantee
	Laurel Oil & Fert. Co., Laurel, Miss.	
4147	S. G. Acid Phosphate	Doyle Kervin, Collins
4264	S. G. Acid Phosphate	W. A. Morrison, Heidelberg
4616	S. G. Acid Phosphate	Mendenhall Merc. Co., Mendenhall

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4601	8.84	6.17	5.35	11.52	1.37	1.75	1.97	21.38
	8.76	**6.92**	**4.29**	**11.21**	**1.74**	**1.68**	**1.86**	**20.75**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.50*	*18.48*
4602	11.16	6.56	2.27	8.83	.91	2.02	4.02	21.46
4603	10.72	5.58	3.40	8.98	1.18	2.07	3.76	21.44
	10.94	**6.07**	**2.84**	**8.91**	**1.04**	**2.04**	**3.89**	**21.45**
		6.00	*2.00*	*8.00*	*1.00*	*2.40*	*3.40*	*21.20*
4145	9.63	7.30	3.41	10.71	1.65	1.74	2.24	20.84
4146	10.55	7.97	3.29	11.26	1.57	1.50	2.10	20.53
4173	9.70	7.73	3.48	11.21	1.20	1.73	2.19	21.35
4174	11.51	7.70	3.50	11.20	1.25	1.64	2.22	21.05
4175	13.97	7.45	3.76	11.21	1.36	1.54	1.94	20.41
4251	13.23	7.92	2.26	10.18	1.98	1.46	2.34	19.44
4262	11.80	8.53	2.65	11.18	1.51	1.64	1.80	20.69
4263	12.01	9.16	2.32	11.48	1.09	1.71	1.97	21.50
4296	12.04	6.37	5.37	11.74	1.01	1.57	2.14	21.19
4332	11.62	8.14	2.67	10.81	1.36	1.63	1.90	20.31
4333	11.75	8.00	2.59	10.59	1.41	1.71	2.01	20.44
4334	10.13	8.46	3.01	11.47	1.20	1.44	2.05	20.55
4389	11.72	8.20	2.42	10.62	1.57	1.73	2.52	21.08
4604	12.50	8.20	2.38	10.58	1.70	1.56	2.44	20.36
4605	12.29	7.43	3.44	10.87	1.33	1.45	2.36	20.14
4606	12.04	6.70	3.42	10.12	1.14	1.68	2.36	20.04
4607	11.81	8.19	3.09	11.28	.86	1.56	2.42	21.11
4608	12.55	8.25	3.23	11.48	1.07	1.50	2.29	20.99
4609	12.64	6.86	3.71	10.57	.86	1.52	2.28	19.91
4610	12.08	8.70	2.75	11.45	.60	1.62	2.30	21.44
4611	11.66	7.71	3.09	10.80	.93	1.62	2.21	20.53
	11.77	**7.86**	**3.13**	**10.99**	**1.27**	**1.60**	**2.19**	**20.66**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*18.78*
4190	10.05	12.38	3.20	15.58	1.56			16.82
4612	12.54	13.98	3.01	16.99	.60			18.39
	11.29	**13.18**	**3.11**	**16.29**	**1.08**			**17.61**
		11.00	*3.00*	*14.00*	*1.00*			*15.10*
4191	10.37	8.26	2.90	11.16	1.34	1.73	1.99	21.15
4390	10.59	8.42	2.84	11.26	1.33	1.71	2.36	21.57
4613	11.07	8.06	3.46	11.52	1.02	1.57	2.07	21.04
4614	10.59	8.25	3.40	11.65	.82	1.65	2.21	21.63
4615	10.96	7.97	3.26	11.23	1.23	1.60	2.06	20.81
	10.71	**8.19**	**3.17**	**11.36**	**1.15**	**1.65**	**2.14**	**21.24**
		8.00	*1.50*	*9.50*	*1.00*	*1.67*	*1.75*	*18.85*
4147	10.55	9.85	2.97	12.82	4.57			13.81
4264	15.26	13.16	1.78	14.94	1.88			16.26
4616	9.30	9.79	2.86	12.65	4.30			13.63

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
4617	S. G. Acid Phosphate	J. P. Cox & Son., Braxton
		Average
		Guarantee
4540	S.G.K.C.Ammoniated Bone	E. E. Bonner, Sandersville
4541	S.G.K.C.Ammoniated Bone	Abney & Travis, Heidelberg
		Average
		Guarantee
4297	Laurel Special H. G. Fert.	W. M. Conner, Hattiesburg
4618	Laurel Special H. G. Fert.	J. F. Thornton, Mize
4619	Laurel Special H. G. Fert.	L. L. Denson, Bay Springs
		Average
		Guarantee
4148	S. G. Plow Brand	J. S. Eaton & Bro., Taylorsville
4176	S. G. Plow Brand	Doyle Kervin, Collins
4265	S. G. Plow Brand	The T. B. Bonner Co., Laurel
4335	S. G. Plow Brand	J. A. Parker & Co., Prentiss
4336	S. G. Plow Brand	McLean & O'Connell Co., Bassfield
4517	S. G. Plow Brand	L. B. Tillson, Mize
4525	S. G. Plow Brand	McLean & O'Connell Co., Bassfield
4620	S. G. Plow Brand	McCollum & Co., Weathersby
4621	S. G. Plow Brand	R. E. Wilkinson Mer. Co., Poplarville
		Average
		Guarantee
	Meridian Fert. Factory, Meridian, Miss.	
4149	S.G.Meridian Eng.Acid Phos	Beeman & Chadwick, Forest
4177	S.G.Meridian Eng.Acid Phos.	Bransby & Bogle, Macon
4266	S.G.Meridian Eng.Acid Phos.	W. H. Gallaspy, Hickory
4337	S.G.Meridian Eng.Acid Phos.	Bransby & Bogle, Macon
4622	S.G.Meridian Eng.Acid Phos.	A. E. Dalrymple & Co., Amory
4623	S.G.Meridian Eng.Acid Phos.	J. L. Wells, Hickory
4624	S.G.Meridian Eng.Acid Phos.	Blumenfeld & Fried, Starkville
		Average
		Guarantee
4252	H. G. Meridian Southern Acid Phosphate	Story & Co., Forest
4267	H. G. Meridian Southern Acid Phosphate	Meridian Fert. Factory, Meridian
4338	H. G. Meridian Southern Acid Phosphate	A. Robert & Co., Lauderdale
4625	H. G. Meridian Southern Acid Phosphate	Ford Bros. Co., Centreville
4626	H. G. Meridian Southern Acid Phosphate	Matthews & Cotton, Iuka
4627	H. G. Meridian Southern Acid Phosphate	W. G. Barnes, Brandon
4628	H. G. Meridian Southern Acid Phosphate	G. R. Edwards, McCool

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4617	8.00	8.53	4.20	12.73	4.30			13.58
	10.72	**10.33**	**2.95**	**13.29**	**3.76**			**14.32**
		10.00	*2.00*	*12.00*	*3.00*			*13.00*
4540	8.27	6.67	4.23	10.90	2.80	1.57	2.03	20.18
4541	12.12	7.98	2.92	10.90	2.44	1.82	1.76	20.92
	10.20	**7.33**	**3.57**	**10.90**	**2.62**	**1.70**	**1.89**	**20.55**
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*1.50*	*17.88*
4297	9.39	4.11	2.37	6.48	3.22	3.03	4.45	22.59
4618	9.84	5.44	2.66	8.10	2.39	2.77	4.12	23.27
4619	10.32	5.59	2.31	7.90	2.35	2.87	4.40	23.69
	9.85	**5.05**	**2.45**	**7.49**	**2.65**	**2.89**	**4.32**	**23.18**
		4.00	*2.00*	*6.00*	*2.00*	*3.00*	*4.00*	*21.50*
4148	11.14	7.89	2.31	10.20	2.81	1.72	1.88	19.91
4176	8.53	7.14	2.65	9.79	3.31	1.79	2.04	19.79
4265	13.09	6.28	2.21	8.49	3.45	1.86	2.05	18.53
4335	11.66	7.62	2.26	9.88	3.30	1.77	1.73	19.56
4336	13.60	4.24	2.38	6.62	3.76	1.90	2.15	16.51
4517	12.38	7.51	2.18	9.69	2.41	1.72	1.56	18.99
4525	10.97	6.01	2.95	8.96	3.42	1.82	1.69	18.52
4620	11.27	6.38	3.14	9.52	2.70	1.62	2.00	18.78
4621	12.14	6.77	2.56	9.33	2.79	1.68	1.69	18.51
	11.64	**6.65**	**2.51**	**9.16**	**3.11**	**1.76**	**1.87**	**18.79**
		7.00	*2.00*	*9.00*	*2.00*	*1.80*	*1.50*	*18.40*
4149	16.95	10.45	3.57	14.02	1.07			15.07
4177	15.95	9.77	2.74	12.51	1.94			13.49
4266	17.76	9.88	2.80	12.68	2.25			13.67
4337	17.91	9.72	2.91	12.63	2.09			13.60
4622	15.50	10.39	3.39	13.78	.82			14.82
4623	13.16	9.47	5.42	14.89	1.24			15.84
4624	12.36	10.32	3.88	14.20	1.56			15.23
	15.66	**10.00**	**3.53**	**13.53**	**1.57**			**14.53**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
4252	13.83	11.33	3.37	14.70	1.45			15.83
4267	14.01	10.72	3.88	14.60	1.52			15.67
4338	14.25	11.10	3.85	14.95	.97			16.06
4625	12.43	12.35	3.21	15.56	.77			16.80
4626	13.87	9.96	3.03	12.99	1.91			13.99
4627	12.58	11.77	3.46	15.23	.79			16.41
4628	12.76	12.61	3.08	15.69	1.00			16.95

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
4629	H. G. Meridian Southern Acid Phosphate	Rogers & Son, Pachuta
		Average
		Guarantee
4298	S. G. Meridian Blood & Bone	J. E. McNair, Lumberton
4299	S. G. Meridian Blood & Bone	Gaddis & Slay Co., Magee
4391	S. G. Meridian Blood & Bone	Myers & Mehaffey, Steenston
4464	S. G. Meridian Blood & Bone	Terrell & Mize, Quincy
4465	S. G. Meridian Blood & Bone	T. W. Foard, Eupora
4630	S. G. Meridian Blood & Bone	Gladding Mer. Co., Gladding
4631	S. G. Meridian Blood & Bone	Dunn Bros., Summit
4632	S. G. Meridian Blood & Bone	R. Watts & Co., Seminary
4633	S. G. Meridian Blood & Bone	Matthews & Cotten, Iuka
4634	S. G. Meridian Blood & Bone	Laurel Mercantile Co., Laurel
		Average
		Guarantee
4635	S.G.Meridian Farmers Friend	Story & Co., Forest
4636	S.G.Meridian Farmers Friend	Story & Co., Forest
		Average
		Guarantee
4150	S.G.Meridain Home Mixture	John McGrath & Sons, Brookhaven
4151	S.G. Meridian Home Mixture	Holloway & McRaney, Collins
4178	S.G. Meridian Home Mixture	Bransby & Bogle, Macon
4179	S.G. Meridian Home Mixture	W. L. Williamson & Co., Collins
4180	S.G. Meridian Home Mixture	Beeman & Chadwick, Forest
4268	S.G. Meridian Home Mixture	Meridian Fert. Factory, Meridian
4269	S.G. Meridian Home Mixture	J. P. Myer, Ellisville
4270	S.G. Meridian Home Mixture	Barnes, Ruffin & Co., Columbia
4300	S.G. Meridian Home Mixture	The T. J. Hubbard Co., Magee
4325	S.G. Meridian Home Mixture	J. P. Myer, Ellisville
4326	S.G. Meridian Home Mixture	E. F. Nunn & Co., Shuqualak
4339	S.G. Meridian Home Mixture	J. H. Williams & Sons, Prentiss
4340	S.G. Meridian Home Mixture	T. C.. Ruble, McHenry
4341	S.G. Meridian Home Mixture	Davis & Buffkin, Buckatunna
4342	S.G. Meridian Home Mixture	A. S. Brinson & Son, New Hebron
4392	S.G. Meridian Home Mixture	Philips, Hinds & Co., Booneville
4466	S.G. Meridian Home Mixture	John McGrath & Sons, Norfield
4467	S.G. Meridian Home Mixture	W. T. Richardson, Newton
4468	S.G. Meridian Home Mixture	M. H. Turner, Vossburg
4469	S.G. Meridian Home Mixture	Liberty Mer. Co., Liberty
4470	S.G. Meridian Home Mixture	Lann & Carter Hardware Co., Aberdeen
4471	S.G. Meridian Home Mixture	J. G. Meadow, Winchester
4472	S.G. Meridian Home Mixture	J. D. Furlick, Rienzi
4509	S.G. Meridian Home Mixture	G. E. Hailes, Moselle
4637	S.G. Meridian Home Mixture	C. F. Rush, Sucarnochie
4638	S.G. Meridian Home Mixture	J. N. Shirley, Brewer
4639	S.G. Meridian Home Mixture	Boswell Bros., Weathersby
4640	S.G. Meridian Home Mixture	R. E. Wilkinson Mer. Co., Poplarville
4641	S.G. Meridian Home Mixture	Ford Bros. Co., Centerville

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4629	11.57	11.04	4.25	15.29	2.44			16.39
	13.16	**11.36**	**3.52**	**14.88**	**1.36**			**16.02**
		12.00	*2.00*	*14.00*	*1.00*			*15.20*
4298	15.16	7.46	2.44	9.90	3.91	1.15	1.26	16.92
4299	14.47	7.22	4.50	11.72	.67	1.41	1.05	19.60
4391	16.88	6.96	2.40	9.36	1.55	1.61	1.52	18.15
4464	13.69	9.20	2.92	12.12	1.60	1.19	2.83	21.25
4465	14.82	9.06	2.98	12.04	1.43	1.08	1.98	19.91
4630	13.50	7.42	2.47	9.89	1.25	2.06	3.30	22.13
4631	13.78	7.48	2.89	10.37	1.45	2.21	2.72	22.61
4632	12.98	8.71	2.21	10.92	2.02	1.84	2.19	21.51
4633	15.60	5.72	4.25	9.97	1.27	1.71	1.53	19.05
4634	12.98	8.35	2.63	10.98	1.71	1.48	2.36	20.45
	14.39	**7.76**	**2.97**	**10.73**	**1.69**	**1.57**	**2.07**	**20.61**
		8.00	*1.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.53*
4635	10.63	6.74	3.33	10.07	1.78	1.60	2.56	19.91
4636	14.14	6.92	2.87	9.79	.96	1.67	1.98	19.29
	12.38	**6.83**	**3.10**	**9.93**	**1.37**	**1.64**	**2.27**	**19.60**
		8.00	*1.50*	*9.50*	*1.00*	*1.64*	*1.50*	*18.49*
4150	13.60	6.84	2.04	8.88	1.72	1.94	1.86	19.10
4151	12.00	7.06	3.14	10.20	1.16	1.85	1.74	20.14
4178	13.30	7.24	2.45	9.69	1.15	1.80	1.92	19.60
4179	12.45	7.18	3.46	10.64	.92	1.70	1.80	20.17
4180	15.15	4.35	2.38	6.73	1.41	1.97	2.25	16.98
4268	14.33	5.18	2.53	7.71	.67	1.91	1.57	17.25
4269	14.03	6.94	2.37	9.31	.63	1.98	1.43	19.30
4270	12.67	7.19	3.37	10.56	1.00	1.50	1.59	19.18
4300	12.31	7.07	3.46	10.53	1.15	1.74	1.58	19.96
4325	13.71	6.52	2.48	9.00	.60	1.94	1.61	18.95
4326	13.32	6.13	2.17	8.30	2.14	2.01	2.27	19.05
4339	12.31	7.04	3.09	10.13	1.13	1.63	1.78	19.33
4340	12.23	6.92	3.27	10.19	1.25	1.60	1.80	19.30
4341	13.71	7.87	2.30	10.17	1.50	1.70	1.71	19.63
4342	11.97	6.87	3.43	10.30	1.06	1.66	2.31	20.14
4392	15.73	6.02	2.32	8.34	1.39	1.71	2.54	18.30
4466	15.49	7.04	2.66	9.70	1.24	1.67	1.71	18.93
4467	15.58	5.36	2.67	8.03	1.02	1.76	2.19	17.72
4468	13.94	7.36	2.13	9.49	1.33	1.83	2.58	20.16
4469	14.07	7.11	2.45	9.56	.84	1.84	2.65	20.32
4470	12.15	7.46	3.52	10.98	1.34	1.86	2.54	21.87
4471	13.88	7.74	1.94	9.68	1.29	1.84	2.78	20.64
4472	14.92	7.61	2.19	9.80	1.28	1.66	2.51	19.86
4509	12.59	7.85	2.26	10.11	1.97	1.59	2.01	20.48
4637	15.56	6.41	2.02	8.43	1.27	1.58	2.04	17.48
4638	14.13	6.24	2.10	8.34	.87	1.71	2.15	17.93
4639	12.37	6.82	3.13	9.95	.88	1.53	1.84	18.82
4640	11.89	7.55	2.29	9.84	1.45	1.78	2.57	20.38
4641	11.44	6.77	3.11	9.88	1.38	1.88	2.44	20.57

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
4642	S.G. Meridian Home Mixture	Bramlett Hardware Co., Corinth
4643	S.G. Meridian Home Mixture	Matthews & Cotten, Iuka
4644	S.G. Meridian Home Mixtnre	A. W. Allen, Tupelo
4645	S.G. Meridian Home Mixture	Hawkins & Co., Hattiesburg
4646	S.G. Meridian Home Mixture	Miss.& Ala.Co-operative Co.,State Line
4647	S.G. Meridian Home Mixture	Lann & Carter Hardware Co., Aberdeen
4648	S.G. Meridian Home Mixture	W. G. Barnes, Brandon
4649	S.G. Meridian Home Mixture	Newberger Mer. Co., Coffeville
4650	S.G. Meridian Home Mixture	Irving & Torbert, Weir
4651	S.G. Meridian Home Mixture	McLeod & Co., Purvis
4652	S.G. Meridian Home Mixture	Jeffcoat & Green, Soso
4653	S.G. Meridian Home Mixture	Loper & Gilbert, Lake
4654	S.G. Meridian Home Mixture	O. Hopkins, Hickory
4655	S.G. Meridian Home Mixture	T. M. Foard, Eupora
4656	S.G. Meridian Home Mixture	G. P. McGhee & Son, Gloster
4657	S.G. Meridian Home Mixture	Laurel Mer. Co., Laurel
		Average
		Guarantee
4658	S.G. Meridian Soluble Guano	W. J. Bell, Pelahatchie
4659	S.G. Meridian Soluble Guano	M. D. Graham & Co., Forest
		Average
		Guarantee
4660	H. G. Meridian Vegetable Grower	Meridian Fertilizer Factory, Meridian
4661	H. G. Meridian Vegetable Grower	R. Watts & Co., Seminary
		Average
		Guarantee
4253	S. G. Hattiesburg Am. Mixture with Bone	Story & Co., Forest
4662	S. G. Hattiesburg Am. Mixure with Bone	G. C. Rew, Forest
		Average
		Guarantee
4301	S.G.Meridian German Kainit	W. W. Pigford, Lumberton
4663	S. G.Meridian German Kainit	F. H. Deays, Enterprise
4664	S.G. Meridian German Kainit	W. G. Barnes, Brandon
		Average
		Guarantee
	New Orleans Acid & Fertilizer Company, New Orleans, La.	
4254	S. G. Black Diamond Acid Phosphate	Sones & Dansby, Forest
4343	S. G. Black Diamond Acid Phosphate	S. S. Dale & Sons, Prentiss
4393	S. G. Black Diamond Acid Phosphate	A. J. Gaston, Ackerman
4474	S. G. Black Diamond Acid Phosphate	M. H. Rothschilds, Woodville

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4642	13.38	7.15	2.49	9.64	1.20	1.76	2.52	20.00
4643	13.59	8.20	3.02	11.22	.95	1.63	2.40	21.27
4644	11.74	7.15	2.70	9.85	2.03	1.95	2.53	20.91
4645	11.50	9.39	2.57	11.96	1.07	1.36	2.16	21.02
4646	10.00	7.52	2.91	10.43	1.84	1.74	2.83	21.15
4647	11.70	7.29	2.50	9.79	1.69	1.62	2.60	19.77
4648	10.27	6.65	3.78	10.43	2.05	1.75	2.75	21.01
4649	11.48	7.50	2.06	9.56	2.72	1.65	2.59	19.63
4650	12.95	8.28	1.63	9.91	1.01	1.65	1.48	18.98
4651	12.61	7.91	1.63	9.54	1.64	1.64	1.83	18.86
4652	12.61	7.54	2.24	9.78	1.87	1.59	1.73	18.81
4653	15.69	7.36	2.10	9.46	.94	1.74	1.87	19.10
4654	15.98	7.24	1.83	9.07	.94	1.50	1.64	17.59
4655	14.59	5.30	2.04	7.34	.69	1.89	1.96	17.18
4656	11.88	7.38	3.26	10.64	1.32	1.96	1.92	21.22
4657	15.39	7.45	2.06	9.51	.86	1.72	2.81	20.04
	13.25	**7.05**	**2.57**	**9.62**	**1.28**	**1.74**	**2.12**	**19.51**
		8.00	*1.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.53*
4658	11.72	7.98	2.35	10.33	1.22	1.64	2.15	20.05
4659	14.68	7.10	4.20	11.30	1.14	1.83	1.73	21.28
	13.20	**7.54**	**3.27**	**10.81**	**1.18**	**1.74**	**1.94**	**20.67**
		8.00	*1.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.53*
4660	10.69	8.69	1.40	10.09	.77	2.27	5.07	24.98
4661	11.50	7.15	1.93	9.08	.97	2.27	6.69	25.34
	11.09	**7.92**	**1.66**	**9.58**	**.87**	**2.27**	**5.88**	**25.16**
		6.00	*2.00*	*8.00*	*1.00*	*2.50*	*5.00*	*23.15*
4253	14.31	7.66	2.48	10.14	1.57	1.67	1.86	19.63
4662	13.97	7.32	3.34	10.66	.95	1.85	1.92	20.85
	14.14	**7.49**	**2.91**	**10.40**	**1.26**	**1.76**	**1.89**	**20.24**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*1.00*	*18.58*
4301	4.09						12.88	12.88
4663	2.02						12.72	12.72
4664	2.15						12.86	12.86
	2.75						**12.82**	**12.82**
							12.00	*12.00*
4254	13.24	11.39	2.79	14.18	1.33			15.32
4343	13.85	11.25	2.33	13.58	1.48			14.71
4393	12.66	10.17	2.86	13.03	2.39			14.05
4474	12.86	9.02	5.22	14.24	.82			15.14

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
4515	S. G. Black Diamond Acid Phosphate	N. R. Hosey, Soso
4665	S. G. Black Diamond Acid Phosphate	J. A. Goree, Columbus
		Average
		Guarantee
4302	S.G.Crescent City Acid Phos	Harrison & Nelson Co., Magee
4666	S.G.Crescent City Acid Phos.	W. M. Hyde, Poplarville
		Average
		Guarantee
4667	S.G. Blood, Bone, & Beef	J. L. Moyse & Bro., Summit
4668	S. G. Blood Bone, & Beef	E. M. Odom, Star
		Average
		Guarantee
4142	S. G. Blood, Bone, & Potash	W. E. Payne, Collins
4669	S. G. Blood, Bone, & Potash	S. Alcus, Summit
		Average
		Guarantee
4536	S.G.Dissolved Bone & Potash	Florence Mer. Co., Florence
4670	S.G.Dissolved Bone & Potash	J. A. Goree, Columbus
		Average
		Guarantee
4152	H. G. Economizer	W. E. Payne, Collins
		Guarantee
4475	S. G. Gold Dust	M. H. Rotschilds, Woodville
4671	S. G. Gold Dust	McLain & Tatum, Gloster
		Average
		Guarantee
4153	S.G. Goldsmith's Imp. Mix.	W. E. Payne, Collins
4255	S. G. Goldsmith's Imp. Mix.	Sones & Dansby, Forest
4303	S. G. Goldsmith's Imp. Mix.	Howie Bros., Morton
4304	S. G. Goldsmith's Imp. Mix.	Harrison & Nelson Co., Magee
4395	S. G. Goldsmith's Imp. Mix.	Mississippi Cotton Oil Co., Columbus
4672	S. G. Goldsmith's Imp. Mix.	W. M. Hyde, Poplarville
4673	S. G. Goldsmith's Imp. Mix.	A. J. McKay, Braxton
4674	S. G. Goldsmith's Imp. Mix.	McComb City Mer. Co., McComb City
		Average
		Guarantee
4394	Jack Gaston's S. G. Cotton & Corn Fertilizer	A. J. Gaston, Ackerman
		Guarantee
	Newton Oil & Mfg. Co., Newton, Miss.	
4305	S. G. Acid Phosphate	L. E. Rushing, Morton
4675	S. G. Acid Phosphate	L. H. Yarbrough, Hickory
		Average
		Guarantee
4306	S. G. Banner C. & C. Brand	L. E. Rushing, Morton
4307	S. G. Banner C. & C. Brand	J. N. Evans, Pelahatchie

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4515	11.52	13.02	3.97	16.99	.90			18.29
4665	12.57	7.52	6.56	14.08	.50			14.83
	12.78	**10.40**	**3.95**	**14.35**	**1.24**			**15.39**
		10.00	*2.00*	*12.00*	*2.00*			*13.00*
4302	13.71	10.84	2.61	13.45	2.09			14.53
4666	10.41	9.10	6.66	15.76	.55			16.67
	12.06	**9.97**	**4.64**	**14.61**	**1.32**			**15.60**
		10.00	*2.00*	*12.00*	*2.00*			*13.00*
4667	12.81	7.79	3.69	11.48	1.29	1.79	1.59	21.26
4668	12.73	7.47	3.58	11.05	.64	1.62	1.66	20.23
	12.77	**7.63**	**3.64**	**11.27**	**.96**	**1.71**	**1.62**	**20.75**
		7.00	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*
4142	13.00	8.66	2.48	11.14	1.89	1.50	1.21	19.58
4669	11.64	7.60	3.55	11.15	.54	1.68	1.81	20.72
	12.32	**8.13**	**3.02**	**11.15**	**1.21**	**1.59**	**1.51**	**20.15**
		7.00	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*
4536	16.70	8.14	4.12	12.26	1.25		3.62	17.92
4670	14.95	8.30	3.41	11.71	.36		2.43	16.14
	15.82	**8.22**	**3.77**	**11.99**	**.80**		**3.02**	**17.03**
		8.00	*2.00*	*10.00*	*2.00*		*2.00*	*13.80*
4152	12.03	9.54	2.74	12.28	1.61	1.44	2.00	21.50
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*19.58*
4475	13.89	10.23	1.67	11.90	.77	1.81	2.15	22.60
4671	14.13	8.01	1.75	9.76	.82	1.62	1.97	19.18
	14.01	**9.12**	**1.71**	**10.83**	**.79**	**1.72**	**2.06**	**20.89**
		7.00	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*
4153	11.90	8.34	2.53	10.87	1.45	1.62	2.17	20.63
4255	10.79	8.29	2.97	11.26	1.05	1.83	1.58	21.20
4303	11.10	8.48	2.25	10.73	1.80	1.68	1.31	19.84
4304	11.33	8.52	3.45	11.97	.99	1.66	1.50	21.33
4395	12.49	8.24	2.74	10.98	2.19	1.71	2.22	21.11
4672	10.95	8.14	2.99	11.13	1.14	1.70	1.55	20.56
4673	12.00	7.19	2.84	10.03	2.12	1.97	1.99	20.64
4674	11.85	8.42	2.07	10.49	.63	1.45	1.36	18.82
	11.55	**8.20**	**2.73**	**10.93**	**1.42**	**1.70**	**1.71**	**20.52**
		7.00	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*
4394	13.49	7.82	3.74	11.56	1.41	1.77	2.11	21.80
		7.00	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*
4305	9.00	9.68	3.82	13.50	7.82			14.47
4675	10.14	7.62	4.00	11.62	1.40			12.38
	9.57	**8.65**	**3.91**	**12.56**	**4.61**			**13.43**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
4306	8.59	5.81	2.68	8.49	4.85	1.69	2.68	18.52
4307	9.16	6.74	2.55	9.29	4.30	1.53	2.43	18.68

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
4676	S. G. Banner C. & C. Brand	Smith, Gaddis & Co., Forest
		Average
		Guarantee
4677	S. G. Pine Land Guano	Newton Oil & M'f'g. Co., Newton
4678	S. G. Pine Land Guano	T. B. Gaddis, Morton
		Average
		Guarantee
	PLANTERS FERTILIZER & CHEMICAL CO., New Orleans, La.	
4518	Planters S. G. Acid Phos.	Robinson Mer. Co., Centreville
4679	Planters S. G. Acid Phos.	Hyman Mer. Co., Summit
		Average
		Guarantee
4519	S. G. Planters Cotton & Corn No. 1	Hyman Mer. Co., Summit
4680	S. G. Planters Cotton & Corn No. 1	Hyman Mer. Co., Summit
		Average
		Guarantee
4520	S. G. Golden Home Mixture	McLean & Ratcliff, Gloster
4681	S. G. Golden Home Mixture	C. Atkinson's Sons Co., Summit
		Average
		Guarantee
4521	S. G. Planters R. B. Superphosphate	Robinson Mer. Co., Centreville
4682	S. G. Planters R. B. Superphosphate	C. Atkinson's Sons Co., Summit
		Average
		Guarantee
4522	Planters H.G.Vegetable Fert	J. C. Harvey, Gallman
		Guarantee
	REFUGE COTTON OIL CO., Columbus, Miss.	
4396	H. G. Columbus Home Made	Myers & Mehaffy, Steenston
4683	H. G. Columbus Home Made	T. W. Foard, Eupora
		Average
		Guarantee
4397	S.G. Refuge Standard Guano	Refuge Cotton Oil Co., Columbus
4684	S.G. Refuge Standard Guano	Clark & Co., Tupelo
		Average
		Guarantee
	SHUBUTA OIL & M'F'G. CO., Shubuta, Miss.	
4351	H. G. Shubuta Acid Phos.	Shubuta Oil & M'f'g. Co., Shubuta
4479	H. G. Shubuta Acid Phos.	Shubuta Oil & M'f'g. Co., Shubuta
		Average
		Guarantee
4352	S. G. Shubuta Mixture	Shubuta Oil & M'f'g. Co., Shubuta

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4676	9.37	6.04	2.96	9.00	3.28	1.57	2.62	18.62
	9.04	**6.20**	**2.73**	**8.93**	**4.14**	**1.60**	**2.58**	**18.61**
		7.00	*1.50*	*8.50*	*1.00*	*1.65*	*2.25*	*18.08*
4677	10.74	6.88	3.05	9.93	3.67	1.14	2.20	17.80
4678	10.47	5.97	3.07	9.04	3.62	1.54	2.89	18.82
	10.60	**6.43**	**3.06**	**9.49**	**3.64**	**1.34**	**2.55**	**18.31**
		7.00	*1.50*	*8.50*	*1.00*	*1.65*	*2.25*	*18.08*
4518	13.47	9.34	4.23	13.57	.95			14.50
4679	9.51	9.38	6.13	15.51	3.36			16.45
	11.49	**9.36**	**5.18**	**14.54**	**2.15**			**15.48**
		10.00	*2.00*	*12.00*	*2.00*			*13.00*
4519	11.41	8.12	2.50	10.62	2.99	1.48	1.81	19.48
4680	10.89	7.70	3.14	10.84	2.49	1.53	1.84	19.89
	11.15	**7.91**	**2.82**	**10.73**	**2.74**	**1.51**	**1.82**	**19.69**
		6.50	*2.50*	*9.00*	*2.00*	*1.65*	*1.00*	*17.33*
4520	10.83	8.17	2.82	10.99	.60	1.62	1.98	20.56
4681	12.06	8.39	2.47	10.86	3.10	1.45	1.75	19.61
	11.44	**8.28**	**2.64**	**10.92**	**1.85**	**1.54**	**1.86**	**20.09**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*17.38*
4521	12.00	7.70	2.82	10.52	.63	2.36	1.47	22.07
4682	12.92	7.16	3.89	11.05	.59	1.64	1.67	20.28
	12.46	**7.43**	**3.36**	**10.79**	**.61**	**2.00**	**1.57**	**21.18**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*17.38*
4522	10.27	6.28	3.23	9.51	.73	2.04	3.85	22.08
		5.00	*2.00*	*7.00*	*2.00*	*2.60*	*3.00*	*20.30*
4396	11.19	8.20	2.76	10.96	1.25	1.68	2.33	21.09
4683	12.80	8.09	2.95	11.04	1.07	1.47	2.10	20.20
	11.99	**8.15**	**2.85**	**11.00**	**1.16**	**1.58**	**2.21**	**20.65**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*19.58*
4397	11.46	7.46	2.06	9.52	1.66	1.71	2.93	20.13
4684	12.94	7.18	3.08	10.26	.42	1.67	2.31	20.16
	12.20	**7.32**	**2.57**	**9.89**	**1.04**	**1.69**	**2.62**	**20.15**
		6.00	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*17.73*
4351	13.43	10.52	3.80	14.32	2.52			15.37
4479	14.59	10.49	3.66	14.15	2.47			15.20
	14.01	**10.51**	**3.73**	**14.24**	**2.49**			**15.29**
		10.00	*4.00*	*14.00*	*1.00*			*15.00*
4352	11.86	6.75	2.21	8.96	1.88	1.69	2.20	18.65

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
4480	S. G. Shubuta Mixture	A. M. Seabrook, State Line
		Average
		Guarantee
4481	S. G. German Kainit	Shubuta Oil & M'f'g. Co., Shubuta
4685	S. G. German Kainit	A. M. Seabrook, State Line
		Average
		Guarantee
	SOUTHERN OIL & FERTILIZER COMPANY, Meridian, Miss.	
4154	Southern's S.G. Acid Phos.	Meyer Bros., Meridian
4686	Southern's S.G. Acid Phos.	Leakesville Mer. Co., Leakesville
		Average
		Guarantee
271	Southern's 20th Century H. G. Acid Phosphate	Southern Oil & Fert. Co., Meridian
4687	Southern's 20th Century H. G. Acid Phosphate	Weatherbee Huggins Co., Waynesboro
		Average
		Guarantee
4155	Southern's S. G. Cotton Grower	G. L. Sansing, Newton
4272	Southern's S. G. Cotton Grower	Southern Oil & Fert. Co., Meridian
		Average
		Guarantee
4688	S. G. Southern's Superior	M. Oates, Bay Springs
4689	S. G. Southern's Superior	Weatherbee Huggins Co., Waynesboro
		Average
		Guarantee
	STANDARD GUANO & CHEMICAL M'F'G. CO., New Orleans, La.	
4156	Stern's H.G. Acid Phos.	C. Atkinson's Sons Co., Summit
4181	Stern's H. G. Acid Phos.	Barnes, Ruffin & Co., Columbia
4273	Stern's H. G. Acid Phos.	The Lampton Co., Columbia
4344	Stern's H. G. Acid Phos.	L. C. Smith, Lauderdale
4368	Stern's H. G. Acid Phos.	W. W. Brashears, Carpenter
4523	Stern's H. G. Acid Phos.	C. Atkinson's Sons Co., Summit
4690	Stern's H. G. Acid Phos.	Grunewald & Lowenberg, McCool
		Average
		Guarantee
4398	Stern's S. G. Acid Phos.	Gilmore, May & Co., Amory
4691	Stern's S. G. Acid Phos.	Hawkins & Co., Hattiesburg
4692	Stern's S. G. Acid Phos.	E. M. Carter & Co., Centreville
		Average
		Guarantee
4182	S.G. Blood, Bone, and Meat	The Lampton Co., Columbia
4256	S.G. Blood, Bone, and Meat	Hyman Mercantile Co., Summit

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4480	11.56	7.52	2.71	10.23	1.13	1.05	1.76	17.44
	11.71	**7.14**	**2.46**	**9.60**	**1.50**	**1.37**	**1.98**	**18.05**
		6.00	*3.00*	*9.00*	*1.00*	*1.65*	*1.60*	*17.88*
4481	2.68						13.20	13.20
4685	2.04						12.10	12.10
	2.36						**12.65**	**12.65**
							12.00	*12.00*
4154	11.29	8.41	4.56	12.97	1.65			13.81
4686	12.79	10.54	3.88	14.42	.51			15.47
	12.04	**9.48**	**4.22**	**13.70**	**1.08**			**14.64**
		9.00	*3.00*	*12.00*	*2.00*			*12.90*
4271	9.74	8.00	7.48	15.48	3.35			16.28
4687	13.32	10.20	4.19	14.39	.56			15.41
	11.53	**9.10**	**5.84**	**14.94**	**1.95**			**15.85**
		10.00	*4.00*	*14.00*	*2.00*			*15.00*
4155	14.00	4.46	6.26	10.72	1.47	1.87	2.01	20.79
4272	9.08	4.84	4.70	9.54	2.20	1.73	1.44	18.47
	11.54	**4.65**	**5.48**	**10.13**	**1.83**	**1.80**	**1.73**	**19.63**
		6.00	*3.00*	*9.00*	*1.00*	*1.65*	*1.00*	*17.28*
4688	11.49	6.61	2.38	8.99	.45	1.53	2.07	17.98
4689	11.46	5.72	2.40	8.12	.60	1.82	2.30	18.17
	11.47	**6.17**	**2.39**	**8.56**	**.52**	**1.68**	**2.18**	**18.08**
		5.00	*3.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.08*
4156	14.56	11.35	2.86	14.21	3.16			15.35
4181	15.15	11.54	2.89	14.43	3.25			15.58
4273	10.17	11.42	4.60	16.02	2.51			17.16
4344	13.32	10.77	2.36	13.13	4.66			14.21
4368	11.50	12.26	2.89	15.15	3.59			16.38
4523	11.64	11.90	3.90	15.80	2.23			16.99
4690	12.07	11.18	4.15	15.33	2.03			16.45
	12.63	**11.49**	**3.38**	**14.87**	**3.06**			**16.02**
		12.00	*2.00*	*14.00*	*2.00*			*15.20*
4398	13.79	12.17	2.80	14.97	3.06			16.19
4691	12.50	10.29	5.29	15.58	2.05			16.61
4692	12.37	11.81	3.27	15.08	1.78			16.26
	12.89	**11.43**	**3.78**	**15.21**	**2.30**			**16.35**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
4182	14.35	6.67	3.04	9.71	3.35	1.92	1.51	19.58
4256	12.40	7.11	3.44	10.55	3.98	1.33	1.46	18.43

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
4693	S.G. Blood, Bone, and Meat	Fernwood Lumber Co., Fernwood
		Average
		Guarantee
4157	S. G. Champion Farmer's Choice	G. Lowenberg & Co., Kosciusko
4399	S. G. Champion Farmer's Choice	Grunewald & Lowenberg, McCool
4694	S. G. Champion Farmer's Choice	R. W. Hinton Co., Lumberton
4695	S. G. Champion Farmer's Choice	Hawkins & Co., Hattiesburg
		Average
		Guarantee
4158	S. G. Miss. Home Guano	C. Atkinson's Sons Co., Summit
4257	S. G. Miss. Home Guano	Hyman Mercantile Co., Summit
4345	S. G. Miss. Home Guano	L. C. Smith, Lauderdale
4696	S. G. Miss. Home Guano	Watts Mercantile Co., Sandersville
4697	S. G. Miss. Home Guano	Hudson & Co., Sumrall
4698	S. G. Miss. Home Guano	C. C. Ewing, Aberdeen
4699	S. G. Miss. Home Guano	Burkett, Burrow & Co., Columbia
		Average
		Guarantee
4183	Pure Raw Ground Bone	The Lampton Co., Columbia
4274	Pure Raw Ground Bone	Barnes, Ruffin & Co., Columbia
4700	Pure Raw Ground Bone	W. Atkinson & Bacot Co., Osyka
		Average
		Guarantee
4159	S. G. Stern's Am. R. B. Superphosphate	Lampton-Rawls Co., Mt. Olive
4184	S. G. Stern's Am. R. B. Superphosphate	Barnes, Ruffin & Co., Columbia
4185	S. G. Stern's Am. R. B. Superphosphate	John McGrath & Sons, Brookhaven
4186	S. G. Stern's Am. R. B. Superphosphate	Holloway & McRaney, Collins
4275	S. G. Stern's Am. R. B. Superphosphate	The Lampton Co., Columbia
4276	S. G. Stern's Am. R. B. Superphosphate	H. B. Lewis, Columbia
4308	S. G. Stern's Am. R. B. Superphosphate	W. C. Ellis Co., Magee
4309	S. G. Stern's Am. R. B. Superphosphate	F. M. Brooks, Magee
4346	S. G. Stern's Am. R. B. Superphosphate	R. L. Berry & Bros., Prentiss
4347	S. G. Stern's Am. R. B. Superphosphate	Clark & Carter, Bassfield
4348	S. G. Stern's Am. R. B. Superphosphate	W. C. Ellis Merc. Co., New Hebron
4349	S. G. Stern's Am. R. B. Superphosphate	Hawkins-McRaney Co., Bassfield

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4693	13.48	7.28	3.35	10.63	1.29	1.85	1.69	20.59
	13.41	**7.02**	**3.28**	**10.30**	**2.87**	**1.70**	**1.55**	**19.53**
		7.00	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.43*
4157	12.83	5.69	3.87	9.56	1.15	1.96	1.80	19.75
4399	12.87	6.63	3.65	10.28	2.39	1.56	2.26	19.69
4694	9.69	7.42	3.11	10.53	1.24	1.63	1.68	19.71
4695	9.10	7.74	1.90	9.64	.95	2.10	1.49	20.22
	11.12	**6.87**	**3.13**	**10.00**	**1.44**	**1.81**	**1.81**	**19.84**
		7.00	*2.50*	*9.50*	*1.00*	*1.65*	*1.00*	*17.93*
4158	9.64	6.17	4.36	10.53	1.23	1.68	2.25	20.33
4257	11.30	7.56	3.70	11.26	4.17	1.19	1.38	18.69
4345	11.80	7.61	2.97	10.58	4.31	1.21	1.57	18.20
4696	9.72	8.64	2.43	11.07	2.24	1.54	1.31	19.74
4697	10.77	8.57	1.89	10.46	1.69	1.33	2.23	19.25
4698	11.57	8.24	3.12	11.36	3.86	1.22	1.65	19.24
4699	11.03	8.25	2.74	10.99	1.60	1.81	2.26	21.51
	10.83	**7.86**	**3.03**	**10.89**	**2.73**	**1.43**	**1.80**	**19.57**
		7.00	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.43*
4183	5.23				15.39	3.23		19.00
4274	6.72				16.21	3.27		19.55
4700	7.19				20.87	2.74		20.03
	6.38				**17.49**	**3.08**		**19.53**
					18.50	*2.50*		*18.00*
4159	12.71	5.50	4.71	10.21	1.16	1.54	1.76	18.93
4184	14.85	6.37	3.34	9.71	2.57	1.63	1.48	18.50
4185	13.38	5.71	4.20	9.91	1.87	1.56	1.66	18.59
4186	9.70	6.49	3.51	10.00	1.78	1.61	1.62	18.90
4275	11.87	8.17	2.82	10.99	3.06	1.48	1.46	19.55
4276	12.71	8.71	2.32	11.03	2.64	1.45	1.57	19.65
4308	13.06	5.64	4.22	9.86	1.59	1.56	1.80	18.67
4309	12.07	7.24	3.19	10.43	3.58	1.49	1.48	18.89
4346	13.36	7.34	2.85	10.19	2.52	1.43	1.63	18.58
4347	11.28	7.68	2.84	10.52	3.56	1.57	1.63	19.47
4348	12.63	5.72	3.74	9.46	2.34	1.56	1.73	18.17
4349	11.80	8.01	2.66	10.67	3.38	1.42	1.70	19.21

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
4524	S. G. Stern's Am. R. B. Superphosphate	C. Atkinson's Sons Co., Summit
4701	S. G. Stern's Am. R. B. Superphosphate	Dunagin & Whitaker Co., Laurel
4702	S. G. Stern's Am. R. B. Superphosphate	R. E. Wilkinson Mer. Co., Poplarville
4703	S. G. Stern's Am. R. B. Superphosphate	J. M. Kelley, Pratt
4704	S. G. Stern's Am. R. B. Superphosphate	E. M. Carter & Co., Centreville
4705	S. G. Stern's Am. R. B. Superphosphate	I. N. Varnado, Osyka
		Average
		Guarantee
4350	S. G. Standard Am. Soluble Guano	P. M. Catchings, Pinola
		Guarantee
4706	H. G. Vegetable Fertilizer	N. R. Hosey, Soso
4707	H. G. Vegetable Fertilizer	Dunagin & Whitaker Co., Laurel
		Average
		Guarantee
4367	S. G. German Kainit	W. W. Brashears, Carpenter
4400	S. G. German Kainit	G. Lowenberg & Co., Kosciusko
4708	S. G. German Kainit	C. Atkinson's Sons Co., Summit
		Average
		Guarantee
	SWIFT FERTILIZER WORKS, Atlanta, Ga.	
4277	Swift's H. G. Cultivator Acid Phosphate	Watts Mer. Co., Sandersville
4709	Swift's H. G. Cultivator Acid Phosphate	Watts Mer. Co., Sandersville
		Average
		Guarantee
4278	Swift's S. G. Cotton Plant Guano	Watts Mer. Co., Sandersville
4710	Swift's S. G. Cotton Plant Guano	J. P. Myer, Ellisville
		Average
		Guarantee
4711	Swift's Red Steer S. G. Guano	W. L. Williamson & Co., Collins
4712	Swift's Red Steer S. G. Guano	Calhoon & Son, Coffeeville
		Average
		Guarantee
	TENNESSEE CHEMICAL CO., Nashville, Tenn.	
4161	S. G. Ox Cotton Guano	A. J. Gaston, Ackerman

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4524	14.38	6.17	4.11	10.28	1.24	1.63	1.95	19.58
4701	11.15	6.65	4.94	11.59	2.46	1.46	1.62	20.14
4702	10.98	6.29	4.56	10.85	2.87	1.50	1.86	19.67
4703	11.12	6.20	4.58	10.78	1.61	1.59	2.06	20.10
4704	14.23	7.64	3.07	10.71	1.38	1.61	2.08	20.26
4705	15.56	7.16	3.53	10.69	1.34	1.57	1.92	19.89
	12.60	**6.82**	**3.62**	**10.44**	**2.27**	**1.54**	**1.72**	**19.27**
		7.00	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.43*
4350	17.05	6.78	3.04	9.82	1.74	1.49	1.76	18.46
		7.00	*2.50*	*9.50*	*1 00*	*1.65*	*1.50*	*18.43*
4706	10.97	3.99	3.29	7.28	1.06	2.63	4.85	22.46
4707	11.63	6.46	1.62	8.08	1.13	2.64	5.96	24.73
	11.30	**5.23**	**2.45**	**7.68**	**1.10**	**2.64**	**5.40**	**23.60**
		5.00	*1.00*	*6.00*	*1.00*	*3.00*	*5.00*	*22.60*
4367	1.26						12.75	12.75
4400	2.22						12.92	12.92
4708	.54						12.40	12.40
	1.34						**12.69**	**12.69**
							12.00	*12.00*
4277	14.61	11.05	3.99	15.04	2.05			16.15
4709	11.70	12.28	2.77	15.05	2.61			16.28
	13.15	**11.67**	**3.38**	**15.05**	**2.33**			**16.22**
		9.00	*5.00*	*14.00*	*1.50*			*14.90*
4278	10.36	7.02	4.20	11.22	2.05	1.34	1.24	18.97
4710	9.08	5.72	4.73	10.45	1.50	1.82	1.75	20.19
	9.72	**6.37**	**4.47**	**10.84**	**1.77**	**1.58**	**1.50**	**19.58**
		6.00	*3.00*	*9.00*	*1.50*	*1.65*	*1.00*	*17.28*
4711	8.47	4.49	4.94	9.43	1.87	1.88	3.03	20.43
4712	8.89	5.92	4.77	10.69	1.24	1.54	3.00	20.74
	8.68	**5.21**	**4.85**	**10.06**	**1.55**	**1.71**	**3.01**	**20.58**
		5.50	*2.50*	*8.00*	*1.50*	*1.65*	*2.00*	*17.13*
4161	9.35	7.01	3.50	10.51	2.33	1.65	1.13	19.17

Laboratory Number	Name of Brand and Manufacturer.	Where and From Whom Collected.
4713	S. G. Ox Cotton Guano	Gaston Mercantile Co., Ackerman
		Average
		Guarantee
	TENNESSEE VALLEY FERT. COMPANY, Florence, Ala.	
4401	S. G. Dissolved Bone	M. N. Franks, Steenston
		Guarantee
4402	S. G. King Cotton Grower	The Star, Booneville
4714	S. G. King Cotton Grower	R. D. Hopper & Co., Tiplersville
4715	S. G. King Cotton Grower	J. C. Callicutt, Iuka
4716	S. G. King Cotton Grower	S. D. Bramlitt, Corinth
		Average
		Guarantee
4403	H. G. Florence Fertilizer	W. L. Bourland, Amory
		Guarantee
	Sold by THREEFOOT BROS. & CO., Meridian, Miss.	
4162	S. G. Prolific Acid Phos	Threefoot Bros. & Co., Meridian
		Guarantee
4279	Threefoot's H. G. English Acid Phosphate	Threefoot Bros. & Co., Meridian
4717	Threefoot's H. G. English Acid Phosphate	F. H. Deays, Enterprise
		Average
		Guarantee
4163	S. G. Threefoot's Improved Mixture	Threefoot Bros. & Co., Meridian
4280	S. G. Threefoot's Improved Mixture	Threefoot Bros. & Co., Meridian
4718	S. G. Threefoot's Improved Mixture	C. V. Aiken, DeSoto
		Average
		Guarantee
	VIRGINIA - CAROLINA CHEMICAL CO., Memphis, Tenn.	
4164	S. G. I. X. L. Acid Phos	Meyer Bros., Meridian
4281	S. G. I. X. L. Acid Phos	Meyer Bros., Meridian
4353	S. G. I. X. L. Acid Phos	Davis & Buffkin, Buckatunna
4719	S. G. I. X. L. Acid Phos	Mullens & Green, Amory
4720	S. G. I. X. L. Acid Phos	A. G. Delmas, Scranton
		Average
		Guarantee
4165	S. G. Royal Acid Phosphate	Winner, Klein & Co., Meridian
4187	S. G. Royal Acid Phosphate	Winner, Klein & Co., Meridian
4721	S. G. Royal Acid Phosphate	McCullar & Co., Booneville
		Average
		Guarantee
4404	Scott's H. G. Acid Phos	Seward & Fancher, McCool

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4713	10.30	8.00	3.56	11.56	.59	1.69	2.63	22.06
	9.82	**7.51**	**3.53**	**11.04**	**1.46**	**1.67**	**1.88**	**20.62**
		6.00	*4.00*	*10.00*	*1.00*	*1.65*	*1.00*	*18.38*
4401	14.44	9.90	3.23	13.13	2.35			14.12
		10.00	*2.00*	*12.00*	*2.00*			*13.00*
4402	10.74	6.29	2.75	9.04	4.18	1.52	1.99	17.88
4714	10.35	5.99	5.64	11.63	3.33	1.67	1.31	20.55
4715	8.53	5.25	3.76	9.01	4.16	1.43	1.63	17.07
4716	8.51	5.07	4.76	9.83	4.78	1.15	1.29	16.64
	9.53	**5.65**	**4.23**	**9.88**	**4.11**	**1.44**	**1.56**	**18.04**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*17.38*
4403	10.16	6.29	2.93	9.22	4.73	1.86	2.00	19.28
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*19.58*
4162	19.34	10.29	3.27	13.56	1.18			14.59
		11.00	*2.00*	*13.00*	*1.00*			*14.10*
4279	12.63	10.40	6.21	16.61	.15			17.65
4717	10.95	10.12	6.21	16.33	.70			17.34
	11.79	**10.26**	**6.21**	**16.47**	**.42**			**17.50**
		13.00	*2.00*	*15.00*	*1.00*			*16.30*
4163	14.16	6.06	2.20	8.26	1.74	1.82	1.85	17.91
4280	13.18	6.69	2.83	9.52	1.96	1.85	1.81	19.43
4718	8.90	7.48	2.53	10.01	1.52	1.89	2.39	20.76
	12.08	**6.74**	**2.52**	**9.26**	**1.74**	**1.85**	**2.02**	**19.37**
		7.50	*2.00*	*9.50*	*2.00*	*1.67*	*1.50*	*18.55*
4164	11.58	9.44	3.44	12.88	2.85			13.82
4281	10.72	8.35	4.31	12.66	.69			13.50
4353	11.54	7.98	4.86	12.84	3.06			13.64
4719	8.35	7.88	6.80	14.68	1.88			15.47
4720	11.16	11.13	1.45	12.58	2.80			13.69
	10.67	**8.96**	**4.17**	**13.13**	**2.26**			**14.02**
		9.00	*3.00*	*12.00*	*2.00*			*12.90*
4165	11.65	10.26	3.61	13.87	.51			14.90
4187	11.92	10.07	5.24	15.31	.56			16.32
4721	7.72	7.91	5.48	13.39	.60			14.18
	10.43	**9.41**	**4.78**	**14.19**	**.56**			**15.13**
		10.00	*2.00*	*12.00*	*2.00*			*13.00*
4404	8.42	9.81	4.38	14.19	1.83			15.17

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
4722	Scott's H. G. Acid Phos	O. Hopkins, Hickory
		Average
		Guarantee
4188	S. G. Mobile Double Eagle Guano	Clegg Bros., Mathiston
4723	S G. Mobile Double Eagle Guano	Nettleton Supply Co., Nettleton
4724	S. G. Mobile Double Eagle Guano	Baldwyn Supply Co., Baldwyn
4725	S. G. Mobile Double Eagle Guano	Tucker & Buford, Pickens
4726	S. G. Mobile Double Eagle Guano	W. W. Harris & Son, Iuka
		Average
		Guarantee
4189	S. G. Mobile R. B. Am. Superphosphate	Clegg Bros., Mathiston
4727	S. G. Mobile R. B. Am. Superphosphate	Tucker & Buford, Pickens
4728	S. G. Mobile R. B. Am. Superphosphate	T. W. Pylant, Purvis
		Average
		Guarantee
4166	S.G.Mobile Standard Guano	Meyer Bros., Meridian
4282	S.G.Mobile Standard Guano	Meyer Bros., Meridian
4729	S.G.Mobile Standard Guano	Myers & Mehaffey, Steenston
4730	S.G.Mobile Standard Guano	Barnett-Davis Supply Co., Booneville
4731	S.G.Mobile Standard Guano	Gilmore, May & Co., Amory
		Average
		Guarantee
4354	S. G. Royal Blood, Bone, and Potash	Donald Bros. Mer. Co., New Hebron
4732	S. G. Royal Blood, Bone, and Potash	Finger, Tapp & Co., Falkner
4733	S. G. Royal Blood, Bone, and Potash	Williams & Freeman, Sandersville
		Average
		Guarantee
4167	S. G. Royal Cotton Boll Guano	Winner, Klein & Co., Meridian
4734	S. G. Royal Cotton Boll Guano	L. L. Price, Toomsuba
		Average
		Guarantee
4310	S. G. Scott's Gossypium Phospho	Donald Bros., Magee
4355	S. G. Scott's Gossypium Phospho	Donald Bros. Mer. Co., New Hebron
4405	S. G. Scott's Gossypium Phospho	Lann & Carter H'd'w. Co., Aberdeen

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4722	9.06	8.76	5.55	14.31	.46			15.19
	8.74	**9.29**	**4.96**	**14.25**	**1.14**			**15.18**
		12.00	*2.00*	*14.00*	*2.00*			*15.20*
4188	10.80	8.55	2.31	10.86	1.73	1.77	2.05	21.05
4723	7.32	7.77	3.07	10.84	2.03	1.81	2.07	21.11
4724	8.65	8.89	2.57	11.46	.35	1.78	1.90	21.63
4725	9.42	8.43	2.61	11.04	.73	1.52	2.02	20.33
4726	9.12	8.35	3.68	12.03	1.37	1.63	2.38	22.15
	9.06	**8.40**	**2.85**	**11.25**	**1.24**	**1.70**	**2.08**	**21.25**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.08*
4189	9.29	8.12	3.00	11.12	2.97	1.79	2.15	21.46
4727	7.63	6.55	3.46	10.01	1.93	1.73	2.20	19.92
4728	7.52	6.63	4.34	10.97	1.68	1.72	2.34	21.09
	8.15	**7.10**	**3.60**	**10.70**	**2.19**	**1.75**	**2.23**	**20.83**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.08*
4166	10.60	6.49	2.61	9.10	2.44	1.78	2.26	19.15
4282	10.66	6.52	2.84	9.36	1.98	1.65	2.25	18.97
4729	10.86	6.59	4.46	11.05	1.15	1.52	2.17	20.30
4730	14.41	6.23	3.86	10.09	.55	1.68	2.43	20.03
4731	8.33	6.58	4.02	10.60	1.45	1.82	2.00	20.69
	10.97	**6.48**	**3.56**	**10.04**	**1.51**	**1.69**	**2.22**	**19.83**
		6.00	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*17.73*
4354	12.62	9.02	2.37	11.39	2.33	1.76	2.30	21.89
4732	11.40	7.60	4.76	12.36	.93	1.52	1.77	21.45
4733	11.20	7.34	4.23	11.57	1.66	1.78	1.97	21.66
	11.74	**7.99**	**3.78**	**11.77**	**1.64**	**1.69**	**2.01**	**21.67**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.08*
4167	13.91	7.74	2.86	10.60	2.26	1.44	2.61	20.08
4734	9.86	6.06	3.31	9.37	1.91	1.55	1.96	18.30
	11.88	**6.90**	**3.09**	**9.99**	**2.08**	**1.50**	**2.28**	**19.19**
		6.00	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*17.73*
4310	10.35	7.16	2.84	10.00	2.64	1.65	1.74	19.23
4355	14.12	9.29	2.81	12.10	1.46	1.23	1.97	20.51
4405	11.24	8.16	2.93	11.09	1.59	1.82	1.94	21.33

Laboratory Number.	Name of Brand and Manufacturer.	Where and From Whom Collected.
4406	S. G. Scott's Gossypium Phospho	Seward & Fancher, McCool
4526	S. G. Scott's Gossypium Phospho	Wagner & Co., Water Valley
4735	S. G. Scott's Gossypium Phospho	Summit Mer. Co., Summit
4736	S. G. Scott's Gossypium Phospho	W. H. Wood, Pontotoc
4737	S. G. Scott's Gossypium Phospho	Crawford Bros., Seminary
4738	S. G. Scott's Gossypium Phospho	J. A. Moody, Poplarville
4739	S. G. Scott's Gossypium Phospho	McComb City Mer. Co., McComb City
4740	S. G. Scott's Gossypium Phospho	D. J. Cochran, Starkville
4746	S. G. Scott's Gossypium Phospho	W. W. Cain, West
		Average
		Guarantee
4407	H. G. Scott's Potasso Phospho	J. Niles Boyd, Kosciusko
4741	H. G. Scott's Potasso Phospho	J. Niles Boyd, Kosciusko
		Average
		Guarantee
4747	H. G. V.-C. Co's. Truck Grower	W. W. Cain, West
		Guarantee
4742	S. G. German Kainit	Tupelo Merc. Co., Tupelo
4743	S. G. German Kainit	Winner, Klein & Co., Meridian
		Average
		Guarantee
	Wesson Cotton Oil & Fertilizer Co., Wesson, Miss.	
4744	S. G. Mutual Friend Mixture	Wesson Cotton Oil & Fert. Co., Wes'n
4745	S. G. Mutual Friend Mixture	J. C. Harvey, Gallman
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4406	12.54	8.65	2.92	11.57	.67	1.84	1.99	22.02
4526	13.07	8.20	2.75	10.95	2.15	1.63	2.04	20.61
4735	11.35	7.97	3.97	11.94	.70	1.82	1.85	22.15
4736	10.49	8.24	2.97	11.21	1.37	1.72	2.13	21.31
4737	11.41	7.98	2.74	10.72	.61	1.57	2.04	20.13
4738	12.35	8.41	2.71	11.12	1.00	1.52	1.55	19.94
4739	11.61	7.89	2.24	10.13	1.38	1.74	1.99	20.01
4740	10.44	7.62	3.83	11.45	1.57	1.69	1.91	21.18
4746	15.46	6.40	3.22	9.62	.47	1.63	2.00	18.93
	12.03	**8.00**	**2.99**	**10.99**	**1.30**	**1.65**	**1.93**	**20.61**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.08*
4407	15.00	10.45	2.21	12.66	1.20		1.99	16.96
4741	12.87	6.58	6.02	12.60	.59		2.13	16.65
	13.93	**8.52**	**4.11**	**12.63**	**.89**		**2.06**	**16.81**
		9.00	*3.00*	*12.00*	*2.00*		*2.00*	*16.10*
4747	9.22	6.87	1.52	8.39	1.61	1.82	6.86	23.15
		6.00	*2.00*	*8.00*	*2.00*	*2.06*	*6.00*	*22.61*
4742	2.67						12.00	12.00
4743	4.44						12.44	12.44
	3.55						**12.22**	**12.22**
							12.00	*12.00*
4744	11.58	7.06	3.70	10.76	.79	1.73	2.89	21.49
4745	12.87	7.82	3.53	11.35	.81	1.54	2.66	21.32
	12.22	**7.44**	**3.61**	**11.05**	**.80**	**1.64**	**2.77**	**21.40**
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*2.00*	*18.38*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1904-05.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrgen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
	ALABAMA CHEMICAL COMPANY, Montgomery, Ala.									
4036	H. G. Rex Dissolved Bone	4036	8.28	12.57	5.15	17.72	.50			$18.98
	Guarantee			*11.00*	*3.00*	*14.00*	*2.00*			*15.10*
4038	H. G. Big Boll Acid Potash	4038	9.41	11.66	4.84	16.50	.40		1.19	20.51
	Guarantee			*10.00*	*3.00*	*13.00*	*2.00*		*1.00*	*16.30*
4037	S. G. Excelsior Acid Potash	4037	8.24	9.63	4.18	13.81	.35		1.37	17.52
	Guarantee			*8.00*	*3.00*	*11.00*	*2.00*		*1.00*	*13.90*
4231	S. G. Big Boll Guano	4231	9.45	8.64	2.15	10.79	1.31	.92	3.59	19.54
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*.82*	*3.00*	*17.67*
4040	H. G. Excelsior Guano	4040	8.05	9.84	3.47	13.31	1.12	1.00	2.98	22.11
	Guarantee			*9.00*	*3.00*	*12.00*	*2.00*	*.82*	*2.50*	*19.47*
4041	S. G. Liberty Bell Guano	4041	5.51	7.21	3.78	10.99	.36	2.23	2.55	23.17
	Guarantee			*6.00*	*2.00*	*8.00*	*2.00*	*1.65*	*2.00*	*17.18*
4042	H. G. Southern Cross Guano	4042	7.51	8.69	2.83	11.52	.93	1.97	2.44	22.88
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*19.58*
	AMERICAN GUANO COMPANY, Nashville, Tenn.									
4212	S. G. Mule Brand Acid Phosphate	4212	11.71	8.31	3.62	11.93	3.13			12.76
	Guarantee			*8.00*	*4.00*	*12.00*	*1.00*			*12.80*
4213	Mule Brand H. G. Dissolved Bone	4213	13.81	11.74	2.97	14.71	2.00			15.88
	Guarantee			*9.00*	*5.00*	*14.00*	*1.00*			*14.90*
4214	S. G. Mule Brand Acid Phosphate and Potash	4214	11.11	5.70	4.38	10.08	3.26		5.34	17.00
	Guarantee			*6.00*	*4.00*	*10.00*	*1.00*		*2.00*	*13.60*
4215	H. G. Mule Brand Klondyke Acid Phosphate and Potash	4215	11.32	5.92	4.45	10.37	2.86		7.02	19.02
	Guarantee			*6.00*	*4.00*	*10.00*	*1.00*		*4.00*	*15.60*

4216	S. G. Mule Brand Blood and Bone Guano	4216	11.57	7.71	2.03	9.74	4.77	.93	2.93	17.67
	Guarantee			*6.00*	*4.00*	*10.00*	*1.00*	*.82*	*1.00*	*15.47*
4217	S. G. Mule Brand Bourland's Cotton Grower	4217	9.27	4.53	5.08	9.61	2.93	1.77	5.39	22.61
	Guarantee			*5.00*	*3.00*	*8.00*	*1.00*	*1.65*	*3.00*	*18.07*
4218	H .G. Mule Brand Cotton Grower	4218	9.84	6.09	3.16	9.25	4.12	1.47	4.36	20.29
	Guarantee			*6.00*	*4.00*	*10.00*	*1.00*	*1.65*	*2.00*	*19.38*
4219	S. G. Mule Brand Cotton, Corn, and Wheat Guano	4219	7.69	3.89	3.11	7.00	5.12	1.73	3.25	17.39
	Guarantee			*5.00*	*3.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.07*
4220	S. G. Mule Brand Gaston's Choice	4220	7.92	4.06	3.15	7.21	5.28	1.75	3.32	17.78
	Guarantee			*5.00*	*3.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.07*
4221	S. G. Mule Brand Standard Blood and Bone	4221	8.47	5.19	3.45	8.64	4.36	1.57	3.06	18.58
	Guarantee			*6.00*	*3.00*	*9.00*	*1.00*	*1.65*	*1.00*	*17.28*
	ARMOUR FERTILIZER WORKS, Atlanta, Ga.									
3993	H. G. Shield Brand Armour's Superphosphate	3993	5.61	10.66	4.05	14.71	.49			15.78
	Guarantee			*12.00*	*2.00*	*14.00*	*1.00*			*15.20*
3994	S. G. Shield Brand King Cotton	3994	5.95	6.76	2.48	9.24	1.00	1.88	2.09	19.51
	Guarantee			*7.00*	*1.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.28*
3995	H. G. Shield Brand Am. Dissolved Bone and Potash	3995	6.45	8.67	2.31	10.98	1.02	1.93	2.09	21.79
	Guarantee			*9.00*	*1.00*	*10.00*	*1.00*	*1.65*	*2.00*	*19.68*
3996	S. G. Shield Brand Superphosphate and Potash	3996	4.91	7.99	3.20	11.19	.49		1.76	14.87
	Guarantee			*9.00*	*1.00*	*10.00*	*1.00*		*2.00*	*13.90*
3997	H. G. Shield Brand Superphosphate and Potash	3997	5.21	7.50	3.21	10.71	.47		3.60	16.13
	Guarantee			*9.00*	*1.00*	*10.00*	*1.00*		*4.00*	*15.90*
3998	H. G. Shield Brand Vegetable Fertilizer	3998	4.24	4.33	1.74	6.07	.62	2.90	7.59	24.85
	Guarantee			*5.00*	*1.00*	*6.00*	*1.00*	*2.47*	*5.00*	*20.75*
4044	H. G. Shield Brand Armour's Dried Blood	4044	5.29					13.79		48.27
	Guarantee							*13.50*		*47.25*
4107	S. G. Shield Brand Armour's Superphosphate	4107	5.65	7.15	6.45	13.60	.64			14.32
	Guarantee			*10.00*	*2.00*	*12.00*	*1.00*			*13.00*
4211	S. G. Helmet Fertilizer No. 282	4211	5.50	7.29	1.72	9.01	1.29	1.67	2.55	19.04
	Guarantee			*7.00*	*1.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.28*
4319	S. G. Shield Brand Armour's Superphosphate "11-1"	4319	8.87	11.93	3.04	14.97	.26			16.16
	Guarantee			*11.00*	*1.00*	*12.00*	*1.00*			*13.10*
4320	S. G. Shield Brand Armour's Kainit	4320	1.15						13.37	13.37
	Guarantee								*12.00*	*12.00*
	BIRMINGHAM FERTILIZER COMPANY, Birmingham, Ala.									
4413	Birmingham H. G. Acid Phosphate	4413	11.97	10.63	4.65	15.28	1.27			16.34
	Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1904-05.

Laboratory Number	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4414	Birmingham S. G. Fertilizer	4414	11.49	7.35	3.44	10.79	.78	1.47	3.30	21.05
	Guarantee			*6.00*	*2.00*	*8.00*	*2.00*	*1.64*	*2.00*	*17.14*
4415	Birmingham H. G. Fertilizer	4415	13.26	8.31	3.72	12.03	.90	1.43	3.17	22.24
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.64*	*2.00*	*19.54*
4497	Birmingham S. G. Acid Phosphate	4497	8.29	8.79	5.62	14.41	1.31			15.29
	Guarantee			*10.00*	*2.00*	*12.00*	*2.00*			*13.00*
4498	Birmingham H. G. Superphosphate	4498	9.13	9.81	7.38	17.19	.95			18.17
	Guarantee			*13.00*	*2.00*	*15.00*	*2.00*			*16.30*
4499	Birmingham S. G. Blood, Bone, and Potash	4499	9.91	7.49	2.22	9.71	1.33	1.68	2.42	19.73
	Guarantee			*6.00*	*2.00*	*8.00*	*2.00*	*1.65*	*2.00*	*17.18*
4560	Birmingham H. G. Truck Fertilizer	4500	10.45	7.13	2.87	10.00	1.19	2.60	5.72	26.53
	Guarantee			*6.00*	*2.00*	*8.00*	*2.00*	*2.46*	*5.00*	*23.01*
	Sold by Blumenfeld & Fried, Ackerman, Miss.									
4048	B. & F.'s Own Mixture	4048	12.02	7.19	2.65	9.84	1.34	1.88	2.88	21.00
	Guarantee			*8.00*	*1.50*	*9.50*	*1.00*	*1.64*	*1.50*	*18.49*
	Brookhaven Progressive Cotton Oil Co., Brookhaven, Miss.									
4206	H. G. Hutchison's Formula	4206	3.99	5.41	3.02	8.43	1.02	3.19	4.47	25.45
	Guarantee			*5.00*	*2.00*	*7.00*	*1.00*	*3.00*	*4.00*	*22.70*
4207	S. G. New South	4207	5.84	7.20	3.22	10.42	1.56	1.85	3.06	21.72
	Guarantee			*7.00*	*2.00*	*9.00*	*1.00*	*1.65*	*1.80*	*18.18*
4763	Brookhaven H. G. Special Mixture	4763	12.63	8.10	2.50	10.60	.70	1.57	2.42	20.39
	Guarantee			*7.00*	*3.00*	*10.00*	*1.00*	*1.65*	*2.00*	*19.48*
	Capital Fertilizer and Manufacturing Co., Jackson, Miss.									
4016	H. G. Acid Phosphate	4016	11.17	9.95	4.15	14.10	.67			15.10
	Guarantee			*10.00*	*4.00*	*14.00*	*1.00*			*15.00*

4017	S. G. Acid Phosphate	4017	11.18	9.30	3.30	12.60	.87			13.53
	Guarantee			*10.00*	*2.00*	*12.00*	*1.00*			*13.00*
4018	H. G. Bone Meal	4018	2.52				26.68	2.61		22.48
	Guarantee						*25.00*	*2.50*		*21.25*
4019	S. G. Cotton Elevator	4019	9.90	6.49	2.51	9.00	.45	1.57	2.39	18.43
	Guarantee			*6.50*	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*17.23*
4020	S. G. Mississippi Guano	4020	9.80	7.59	1.43	9.02	.39	1.53	2.55	18.59
	Guarantee			*6.50*	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*17.23*
4021	S. G. Nonpariel	4021	9.79	6.25	2.65	8.90	.44	1.55	2.55	18.39
	Guarantee			*6.50*	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*17.23*
4022	S. G. Red Star Brand	4022	10.12	6.40	2.94	9.34	.35	1.51	2.53	18.73
	Guarantee			*6.50*	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*17.23*
4023	H. G. Vegetable Grower	4023	9.53	7.36	3.21	10.57	.43	2.19	3.13	23.16
	Guarantee			*5.00*	*2.00*	*7.00*	*1.00*	*2.50*	*4.00*	*20.95*
4024	S. G. German Kainit	4024	1.35						15.59	15.59
	Guarantee								*12.00*	*12.00*
	CONTINENTAL FERTILIZER COMPANY, Nashville, Tenn.									
4317	S. G. Sunny South Acid Phosphate	4317	10.31	8.26	4.87	13.13	1.01			13.96
	Guarantee			*8.00*	*5.00*	*13.00*	*1.00*			*13.80*
4318	S. G. Eddystone Soluble Guano	4318	8.51	5.75	4.65	10.40	1.36	1.48	1.56	18.76
	Guarantee			*6.00*	*3.00*	*9.00*	*1.00*	*1.65*	*1.00*	*17.28*
	CRYSTAL SPGS OIL MILL, FERT. & MFG. CO., Crystal Springs, Miss.									
4445	Crystal H. G. Acid Phosphate	4445	11.19	11.94	4.60	16.54	.93			17.73
	Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*
4109	S. G. Crystal Star	4109	7.18	7.93	2.81	10.74	1.94	1.73	2.35	21.01
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.70*	*1.90*	*19.00*
4208	H. G. Crystal Vegetable Grower	4208	7.44	5.21	2.96	8.17	.49	3.00	4.50	24.51
	Guarantee			*3.00*	*3.00*	*6.00*	*1.00*	*3.00*	*4.00*	*21.40*
4222	S. G. Lotterhos & Huber's Cotton Fertilizer	4222	10.79	6.83	3.30	10.13	.71	1.89	2.61	21.05
	Guarantee			*6.50*	*1.50*	*8.00*	*.50*	*1.75*	*2.00*	*17.58*
4223	H. G. Lotterhos & Huber's Vegetable Fertilizer	4223	7.66	4.62	2.98	7.60	.53	3.34	6.30	26.81
	Guarantee			*4.00*	*1.00*	*5.00*	*.60*	*3.00*	*5.00*	*21.40*
4446	S. G. German Kainit	4446	3.42						12.75	12.75
	Guarantee								*12.00*	*12.00*
	EAGLE COTTON OIL CO., Meridian, Miss.									
4238	Eagle H. G. Acid Phosphate	4238	10.63	10.35	4.60	14.95	.58			15.99
	Guarantee			*11.50*	*2.50*	*14.00*	*1.50*			*15.15*
4488	Eagle H. G. Acid Phosphate	4488	10.06	10.82	3.62	14.44	1.34			15.52
	Guarantee			*10.00*	*4.00*	*14.00*	*.50*			*15.00*

TABLE III—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1904-05.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4239	S. G. Farm Mixture	4239	10.37	7.06	2.38	9.44	.55	1.73	2.50	19.65
	Guarantee			*6.00*	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.18*
4240	H. G. Farm Mixture	4240	8.75	7.84	3.67	11.51	.56	1.79	1.41	21.12
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*19.58*
4489	S. G. German Kainit	4489	3.36						12.13	12.13
	Guarantee								*12.00*	*12.00*
	FEDERAL CHEMICAL COMPANY, Louisville, Ky., MARKS & GAYLE, Division Managers, Montgomery, Ala.									
4081	Daybreak Pure H. G. Acid Phosphate	4081	8.78	10.08	5.64	15.72	.40			16.73
	Guarantee			*10.00*	*4.00*	*14.00*	*1.00*			*15.00*
4082	Daybreak Pure H. G. Acid Phosphate No. 2	4082	11.18	11.43	5.64	17.07	.50			18.21
	Guarantee			*10.67*	*5.33*	*16.00*	*1.00*			*17.07*
4083	Daybreak S. G. Acid Phosphate with Potash No. 2	4083	8.66	7.16	4.69	11.85	.59		2.78	16.53
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*		*2.00*	*13.80*
4084	Daybreak Pure H. G. Acid Phosphate with Potash No. 3	4084	11.79	7.97	3.85	11.82	.30		4.13	17.93
	Guarantee			*6.67*	*3.33*	*10.00*	*1.00*		*4.00*	*15.67*
4085	S. G. Daybreak Fertilizer	4085	8.94	7.73	3.71	11.44	.58	1.97	2.50	22.75
	Guarantee			*5.33*	*2.67*	*8.00*	*1.00*	*1.65*	*2.00*	*17.11*
4086	H. G. Daybreak Fertilizer "A 1"	4086	10.47	10.70	4.52	15.22	.21	1.22	2.81	24.89
	Guarantee			*8.67*	*4.33*	*13.00*	*1.00*	*.82*	*2.00*	*20.04*
4087	H. G. Daybreak Fertilizer "A A"	4087	9.91	8.25	4.15	12.40	.27	1.48	2.41	22.06
	Guarantee			*7.33*	*3.67*	*11.00*	*1.00*	*.82*	*2.00*	*17.70*
4088	The Complete H. G. Fertilizer	4088	8.91	7.19	3.70	10.89	.54	2.09	2.42	22.43
	Guarantee			*6.67*	*3.33*	*10.00*	*1.00*	*1.65*	*2.00*	*19.44*

4089	S. G. German Kainit	4089	.87						12.13	12.13
	Guarantee								*12.00*	*12.00*
	GULFPORT COTTON OIL, FERTILIZER & MFG. Co., Gulfport, Miss.									
4091	Primo H. G. Acid Phosphate	4091	12.13	10.81	6.82	17.63	.40			18.71
	Guarantee			*14.00*	*2.00*	*16.00*	*1.00*			*17.40*
4092	Primo H. G. Acid Phosphate and Potash	4092	10.25	7.14	3.30	10.44	.45		4.43	16.63
	Guarantee			*8.00*	*2.00*	*10.00*	*1.50*		*4.00*	*15.80*
4093	Primo H. G. R. B. Superphosphate	4093	8.66	7.42	2.80	10.22	.58	2.17	2.10	21.68
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*19.58*
4094	Primo H. G. Blood & Bone	4094	7.88	7.44	2.56	10.00	.91	2.24	2.12	21.70
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*19.58*
4095	Primo S. G. R. B. Superphosphate	4095	6.31	6.11	2.39	8.50	.32	2.52	2.11	20.89
	Guarantee			*6.00*	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.18*
4096	Primo S. G. Cottonseed Meal Compound	4096	8.23	5.50	2.85	8.35	.40	1.62	1.81	17.22
	Guarantee			*6.00*	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.18*
4097	Primo H. G. Nitrate of Soda	4097	.54					15.05		52.68
	Guarantee							*16.50*		*57.75*
4098	Primo Raw Ground Bone	4098	3.58				24.74	3.09		23.19
	Guarantee						*18.50*	*2.50*		*18.00*
4099	Primo H. G. Vegetable Grower	4099	4.85	5.00	1.58	6.58	.32	2.98	4.98	23.15
	Guarantee			*5.00*	*1.00*	*6.00*	*1.00*	*3.00*	*5.00*	*22.60*
4100	Primo S. G. German Kainit	4100	.51						12.22	12.22
	Guarantee								*12.00*	*12.00*
	HAZLEHURST OIL MILL & FERTILIZER Co., Hazlehurst, Miss.									
3965	H. G. Acid Phosphate	3965	11.40	12.11	4.83	16.94	1.07			18.15
	Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*
3966	S. G. Imperial Fertilizer	3966	11.90	7.21	2.64	9.85	1.20	1.92	2.44	20.62
	Guarantee			*7.00*	*2.00*	*9.00*	*1.00*	*1.65*	*2.00*	*18.38*
3967	H. G. Imperial Vegetable Grower	3967	8.97	3.55	2.54	6.09	.66	3.04	4.13	21.82
	Guarantee			*5.00*	*2.00*	*7.00*	*1.00*	*2.50*	*3.00*	*19.95*
3968	S. G. Superior Fertilizer	3968	11.85	7.17	3.03	10.20	.89	1.77	2.46	20.59
	Guarantee			*7.00*	*2.00*	*9.00*	*1.00*	*1.65*	*2.00*	*18.38*
3969	S. G. German Kainit	3969	2.91						13.89	13.89
	Guarantee								*12.00*	*12.00*
	JACKSON FERTILIZER COMPANY, Jackson, Miss.									
4196	H. G. Acid Phosphate	4196	11.02	13.73	2.84	16.57	1.25			17.94
	Guarantee			*12.00*	*2.00*	*14.00*	*1.00*			*15.20*
4197	S. G. Black Hawk Acid Phosphate	4197	9.83	9.44	4.44	13.88	1.58			14.82
	Guarantee			*10.00*	*2.00*	*12.00*	*1.00*			*13.00*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1904-05.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4198	S. G. Chicago R. B. Superphosphate	4198	8.01	7.09	4.06	11.15	3.02	1.74	1.82	21.08
	Guarantee			*7.50*	*2.00*	*9.50*	*1.00*	*1.65*	*1.50*	*18.48*
4420	H. G. Fruit and Vegetable Fertilizer	4420	12.08	5.34	2.27	7.61	.68	2.88	6.96	25.95
	Guarantee			*3.00*	*3.00*	*6.00*	*1.00*	*3.00*	*4.00*	*21.40*
4199	S. G. Gulf States Guano	4199	10.48	7.95	3.66	11.61	1.05	1.66	2.28	21.66
	Guarantee			*7.50*	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*18.78*
4200	S. G. Lampton's Am. R. B. Superphosphate	4200	7.95	7.11	4.76	11.87	2.61	1.66	1.89	21.47
	Guarantee			*7.50*	*2.00*	*9.50*	*1.00*	*1.65*	*1.50*	*18.48*
4419	H. G. Lotterhos & Huber's Special Fertilizer	4419	12.89	5.89	2.44	8.33	1.08	2.26	3.89	21.55
	Guarantee			*6.00*	*2.00*	*8.00*	*1.00*	*2.40*	*3.40*	*21.20*
4201	H. G. Magnolia Brand	4201	9.51	7.26	3.28	10.54	1.15	2.00	2.66	21.98
	Guarantee			*7.50*	*2.00*	*9.50*	*1.00*	*1.65*	*2.50*	*19.48*
4202	S. G. Royal "C" Brand	4202	10.07	8.44	3.95	12.39	.92	1.61	2.26	22.37
	Guarantee			*7.50*	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*18.78*
4203	S. G. German Kainit	4203	1.35						13.48	13.48
	Guarantee								*12.00*	*12.00*
	JEFFERSON GIN & OIL MILL., Harriston, Miss.									
4441	Jefferson H. G. Acid Phosphate	4441	10.01	10.79	4.57	15.36	2.27			16.44
	Guarantee			*10.00*	*4.00*	*14.00*	*1.00*			*15.00*
4442	S. G. Fortuna	4442	8.77	7.93	3.77	11.70	1.04	2.47		22.31
	Guarantee			*8.00*	*2.00*	*10.00*	*.80*	*2.45*		*20.38*
4443	Jefferson Standard Grade	4443	9.91	6.07	4.06	10.13	1.19	1.59	2.03	19.35
	Guarantee			*6.75*	*2.25*	*9.00*	*.55*	*1.65*	*1.75*	*18.10*
4444	S. G. Royal German Kainit	4444	2.96						12.35	12.35
	Guarantee								*12.00*	*12.00*

	KOSCIUSKO OIL MILL & FERTILIZER COMPANY, Kosciusko, Miss.									
4104	H. G. Acid Phosphate	4104	11.97	13.12	3.62	16.74	1.92			18.05
	Guarantee			*11.00*	*3.00*	*14.00*	*1.00*			*15.10*
4105	S. G. Peerless Guano	4105	9.96	7.62	3.12	10.74	1.32	1.81	2.30	21.21
	Guarantee			*8.00*	*1.50*	*9.50*	*1.00*	*1.67*	*1.75*	*18.85*
4532	S. G. German Kainit	4532	3.87						12.92	12.92
	Guarantee								*12.00*	*12.00*
	LAUREL OIL & FERTILIZER CO., Laurel, Miss.									
4027	Laurel S. G. Acid Phosphate	4027	11.83	10.85	2.75	13.60	3.46			14.69
	Guarantee			*10.00*	*2.00*	*12.00*	*3.00*			*13.00*
4028	Laurel Special H. G. Fertilizer	4028	7.84	5.39	2.75	8.14	2.36	2.76	3.91	23.06
	Guarantee			*4.00*	*2.00*	*6.00*	*2.00*	*3.00*	*4.00*	*21.50*
4029	S G. Plow Brand	4029	9.50	7.81	2.98	10.79	3.15	1.43	1.81	19.67
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.80*	*1.50*	*18.40*
4362	S. G. K. C. Ammoniated Bone	4362	9.48	7.90	3.26	11.16	2.95	1.66	1.97	20.85
	Guarantee			*7.00*	*2.00*	*9.00*	*1.00*	*1.65*	*1.50*	*17.88*
	MARBACH & EAGAN, Crystal Springs, Miss.									
4090	S. G. Bat Guano	4090	9.67				12.37	4.26	1.06	22.16
	Guarantee						*5.00*	*4.25*	*.65*	*18.03*
	P. B. MATHIASON M'F'G. CO. St. Louis, Mo.									
4209	Increscent Brand Arkansas Cotton & Corn Grower	4209	5.00	3.49	3.75	7.24	3.67	1.67	3.67	17.83
	Guarantee			*5.00*	*3.00*	*8.00*	*2.00*	*1.66*	*2.00*	*17.11*
4210	Increscent Brand Dissolved Bone	4210	7.23	5.26	4.84	10.10	3.36	3.00	3.26	25.40
	Guarantee			*6.00*	*3.00*	*9.00*	*2.00*	*3.00*	*4.00*	*25.00*
4552	Increscent Brand Potato and Tobacco Grower	4552	3.28	2.12	4.38	6.50	2.89	2.23	7.51	22.68
	Guarantee			*3.00*	*4.00*	*7.00*	*3.00*	*1.66*	*4.50*	*18.31*
4553	Increscent Brand Southern Special	4553	8.34	4.98	5.28	10.26	2.27	2.22	2.10	21.65
	Guarantee			*4.00*	*5.00*	*9.00*	*3.00*	*2.47*	*2.00*	*20.95*
	MERIDIAN FERTILIZER FACTORY, Meridian, Miss.									
3959	S. G. Meridian English Acid Phosphate	3959	13.14	9.70	4.10	13.80	.71			14.77
	Guarantee			*10.00*	*2.00*	*12.00*	*1.00*			*13.00*
3958	H. G. Meridian Southern Acid Phosphate	3958	12.81	10.23	3.86	14.09	.85			15.11
	Guarantee			*12.00*	*2.00*	*14.00*	*1.00*			*15.20*
3960	S. G. Meridian Blood and Bone	3960	12.51	6.69	3.09	9.78	4.12	1.53	1.74	18.52
	Guarantee			*8.00*	*1.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.53*
4205	S. G. Meridian Farmer's Friend	4205	11.94	6.86	2.53	9.39	.99	1.84	2.20	19.66
	Guarantee			*8.00*	*1.50*	*9.50*	*1.00*	*1.64*	*1.50*	*18.49*
3961	S. G. Meridian Home Mixture	3961	13.13	5.93	3.94	9.87	1.40	1.77	2.14	19.77
	Guarantee			*8.00*	*1.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.53*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1904-05.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
3962	S. G. Meridian Soluble Guano	3962	13.13	5.93	3.94	9.87	1.40	1.77	2.14	19.77
	Guarantee			*8.00*	*1.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.53*
3963	H. G. Meridian Vegetable Grower	3963	12.07	5.94	2.74	8.68	.21	2.35	6.79	25.16
	Guarantee			*6.00*	*2.00*	*8.00*	*1.00*	*2.50*	*5.00*	*23.15*
4026	S. G. Hattiesburg Ammoniated Mixture with Bone	4026	9.71	8.39	3.69	12.08	.55	1.45	2.27	21.47
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*	*1.65*	*1.00*	*18.58*
3964	S. G. Meridian German Kainit	3964	5.81						12.27	12.27
	Guarantee								*12.00*	*12.00*
	NEW ORLEANS ACID AND FERTILIZER COMPANY, New Orleans, La.									
3970	S. G. Black Diamond Acid Phosphate	3970	11.98	9.97	2.51	12.48	1.60			13.48
	Guarantee			*10.00*	*2.00*	*12.00*	*2.00*			*13.00*
3971	S. G. Crescent City Acid Phosphate	3971	10.10	10.04	2.20	12.24	1.58			13.24
	Guarantee			*10.00*	*2.00*	*12.00*	*2.00*			*13.00*
3972	S. G. Blood, Bone, and Beef	3972	12.96	7.38	3.42	10.80	1.29	1.79	1.38	20.26
	Guarantee			*7.00*	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*
3973	S. G. Blood, Bone, and Potash	3973	12.91	7.63	3.10	10.73	1.42	1.73	1.27	19.89
	Guarantee			*7.00*	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*
3974	S. G. Dissolved Bone and Potash	3974	9.71	5.99	3.48	9.47	1.43		2.30	13.32
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*		*2.00*	*13.80*
	H. G. Economizer	3975	12.71	7.78	3.33	11.11	1.31	1.50	2.71	20.96
3975	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*19.58*
	S. G. Gold Dust	3976	13.03	7.74	2.30	10.04	1.55	2.05	1.71	20.70
3976	Guarantee			*7.00*	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*
	S. G. Goldsmith's Improved Mixture	3977	12.60	7.61	2.50	10.11	1.70	1.97	1.76	20.54
3977	Guarantee			*7.00*	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*

4361	Jack Gaston's S. G. Cotton and Corn Fertilizer	4361	12.21	7.74	3.12	10.86	2.62	1.50	1.36	19.33
	Guarantee			*7.00*	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*
3978	H. G. Vegetable Grower	3978	11.14	5.91	2.13	8.04	1.02	2.78	3.94	23.11
	Guarantee			*6.00*	*1.25*	*7.25*	*2.00*	*2.80*	*2.60*	*20.98*
3979	S. G. German Kainit	3979	5.79						13.26	13.26
	Guarantee								*12.00*	*12.00*
	NEWTON OIL & M'F'G. Co., Newton, Miss.									
4771	S. G. Acid Phosphate	4771	9.57	8.99	5.51	14.50	1.47			15.40
	Guarantee			*10.00*	*2.00*	*12.00*	*1.00*			*18.00*
4770	Newton's H. G. Acid Phosphate 14 %	4770	7.58	10.07	4.88	14.95	2.10			15.96
	Guarantee			*12.00*	*2.00*	*14.00*	*1.00*			*15.20*
4769	Newton's H. G. Acid Phosphate 16 %	4769	7.30	12.35	5.30	17.65	1.00			18.89
	Guarantee			*14.00*	*2.00*	*16.00*	*1.00*			*17.40*
4772	S. G. Banner C. and C. Brand	4772	13.40	4.52	2.51	7.03	.55	2.56	3.35	20.50
	Guarantee			*7.00*	*1.50*	*8.50*	*1.00*	*1.65*	*2.25*	*18.08*
4773	S. G. Pine Land Guano	4773	13.63	6.76	2.90	9.66	.84	2.35	1.49	21.02
	Guarantee			*7.00*	*1.50*	*8.50*	*1.00*	*1.65*	*2.25*	*18.08*
4774	S. G. German Kainit	4774	2.08						12.91	12.91
	Guarantee								*12.00*	*12.00*
	PLANTERS FERTILIZER & CHEMICAL Co., New Orleans, La.									
4324	Planter's S. G. Acid Phosphate	4324	8.18	9.99	2.33	12.32	2.66			13.32
	Guarantee			*10.00*	*2.00*	*12.00*	*2.00*			*13.00*
4495	S. G. Planter's Cotton and Corn No. 1	4495	9.43	8.28	2.76	11.04	1.79	1.78	1.93	21.13
	Guarantee			*6.50*	*2.50*	*9.00*	*2.00*	*1.65*	*1.00*	*17.33*
4321	S. G. Planter's Golden Home Mixture	4321	10.58	7.52	3.41	10.93	1.62	1.81	1.18	20.29
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*17.38*
4322	S. G. Planter's Raw Bone Superphosphate	4322	13.66	8.27	2.05	10.32	1.68	1.47	1.30	18.62
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*17.38*
4323	H. G. Planter's Vegetable Fertilizer	4323	11.98	7.20	1.77	8.97	1.52	2.80	3.15	23.54
	Guarantee			*5.00*	*2.00*	*7.00*	*2.00*	*2.60*	*3.00*	*20.30*
	REFUGE COTTON OIL Co., Columbus, Miss.									
4232	H. G. Refuge Acid Phosphate	4232	8.59	11.05	4.21	15.26	1.16			16.37
	Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*
4233	H. G. Columbus Home Made	4233	9.29	7.55	3.55	11.10	.48	1.99	2.01	21.94
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*19.58*
4234	S. G. Refuge Standard Guano	4234	9.73	7.03	3.31	10.34	.65	1.63	2.42	20.20
	Guarantee			*6.00*	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*17.73*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1904-05.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
	SHUBUTA OIL & M'F'G. CO., Shubuta, Miss.									
4236	H. G. Shubuta Acid Phosphate	4236	12.73	9.79	3.59	13.38	2.43			14.36
	Guarantee			*10.00*	*4.00*	*14.00*	*1.00*			*15.00*
4237	S. G. Shubuta Mixture	4237	9.57	6.21	2.74	8.95	1.80	2.04	1.98	19.59
	Guarantee			*6.00*	*3.00*	*9.00*	*1.00*	*1.65*	*1.60*	*17.88*
4328	S. G. Shubuta German Kainit	4328	1.01						13.42	13.42
	Guarantee								*12.00*	*12.00*
	SOUTHERN OIL & FERTILIZER CO., Meridian, Miss.									
4449	Southern's S. G. Acid Phosphate	4449	11.16	8.13	3.79	11.92	.44			12.73
	Guarantee			*9.00*	*3.00*	*12.00*	*2.00*			*12.90*
4450	Southern's 20th Century H. G. Acid Phosphate	4450	11.69	12.28	3.18	15.96	1.62			16.69
	Guarantee			*10.00*	*4.00*	*14.00*	*2.00*			*15.00*
4451	Southern's S. G. Cotton Grower	4451	9.97	6.00	3.70	9.70	1.95	1.31	1.88	17.74
	Guarantee			*6.00*	*3.00*	*9.00*	*1.00*	*1.65*	*1.00*	*17.28*
4452	Southern's S. G. Superior Guano	4452	15.63	6.23	2.08	8.31	.78	1.43	2.15	16.92
	Guarantee			*5.00*	*3.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.08*
4507	Southern's S. G. German Kainit	4507	4.70						10.74	10.74
	Guarantee								*12.00*	*12.00*
	STANDARD GUANO & CHEMICAL M'F'G. CO., New Orleans, La.									
4001	Stern's H. G. Acid Phosphate	4001	14.13	12.38	3.50	15.88	2.14			17.12
	Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*
4108	Stern's S. G. Acid Phosphate	4108	13.58	12.11	4.53	16.64	2.12			17.85
	Guarantee			*10.00*	*2.00*	*12.00*	*1.00*			*13.00*
4002	H. G. Dissolved Bone	4002	12.28	14.94	2.39	17.33	.60			18.82
	Guarantee			*12.00*	*3.00*	*15.00*	*1.00*			*16.20*

4003	S. G. Champion Farmer's Choice	4003	11.72	7.73	3.17	10.90	1.43	1.95	1.97	21.56
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.65*	*1.00*	*17.93*
4004	Ground Bone	4004	5.73				20.25	3.59		22.69
	Guarantee						18.50	2.50		18.00
4005	S. G. Miss. Home Guano	4005	11.27	7.82	3.08	10.90	1.52	1.95	1.89	21.49
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.43*
4006	S. G. Pelican Raw Bone Guano	4006	10.19	5.86	5.31	11.17	1.31	1.93	2.27	21.90
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.43*
4007	Stern's S. G. Ammoniated R. B. Superphosphate	4007	10.29	5.82	5.23	11.05	1.36	1.94	2.35	21.88
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.43*
4008	S. G. Standard Ammoniated Soluble Guano	4008	10.00	5.90	5.18	11.08	1.30	1.87	2.21	21.53
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.43*
4009	S. G. Standard Blood, Bone, and Meat	4009	10.47	5.72	4.93	10.65	1.17	1.98	2.00	21.22
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*18.43*
4010	H. G. Standard Sugar Fertilizer	4010	11.17	7.75	4.28	12.03	.96	2.38	2.73	25.07
	Guarantee			*8.50*	*1.50*	*10.00*	*1.00*	*2.50*	*2.00*	*22.60*
4011	H. G. Vegetable Fertilizer	4011	7.78	4.60	3.12	7.72	1.03	3.07	5.28	24.98
	Guarantee			*5.00*	*1.00*	*6.00*	*1.00*	*3.00*	*5.00*	*22.60*
4012	S. G. German Kainit	4012	1.90						14.19	14.19
	Guarantee								*12.00*	*12.00*
	SWIFT FERTILIZER WORKS, Atlanta, Ga.									
4115	Swift's Chattahoochee S. G. Acid Phosphate	4115	11.03	7.79	5.56	13.35	3.27			14.13
	Guarantee			*7.00*	*5.00*	*12.00*	*1.50*			*12.70*
4116	Swift's Cultivator H. G. Acid Phosphate	4116	13.64	11.18	3.47	14.65	2.30			15.77
	Guarantee			*9.00*	*5.00*	*14.00*	*1.50*			*14.90*
4117	Swift's Cotton King H. G. Guano	4117	7.09	6.34	4.36	10.70	2.97	2.44	2.85	23.79
	Guarantee			*6.00*	*3.00*	*9.00*	*1.50*	*2.47*	*2.00*	*21.15*
4118	Swift's Cotton Plant S. G. Guano	4118	8.37	6.17	3.90	10.07	2.31	2.18	1.42	20.74
	Guarantee			*6.00*	*3.00*	*9.00*	*1.50*	*1.65*	*1.00*	*17.28*
4119	Swift's Eagle H. G. Guano	4119	6.89	5.98	4.76	10.74	3.49	2.05	2.49	22.08
	Guarantee			*6.50*	*3.50*	*10.00*	*1.50*	*1.65*	*2.00*	*19.43*
4120	Swift's Farmers Home H. G. Guano	4120	5.90	3.79	6.65	10.44	2.71		5.27	17.13
	Guarantee			*6.00*	*4.00*	*10.00*	*1.50*		*4.00*	*15.60*
4121	Swift's Field and Farm S. G. Guano	4121	8.37	5.03	5.50	10.53	1.64		2.92	15.01
	Guarantee			*6.00*	*4.00*	*10.00*	*1.50*		*2.00*	*13.60*
4122	Swift's Golden Harvest S. G. Guano	4122	6.07	5.46	4.55	10.01	2.40	1.91	2.79	21.03
	Guarantee			*5.50*	*2.50*	*8.00*	*1.50*	*1.65*	*2.00*	*17.13*
4123	Swift's Monarch H. G. Guano	4123	6.87	5.43	3.84	9.27	2.79	3.27	4.53	26.72
	Guarantee			*5.50*	*2.50*	*8.00*	*1.50*	*3.29*	*4.00*	*24.87*

TABLE III—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1904-05.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4124	Swift's Red Steer S. G. Guano	4124	5.86	5.80	4.20	10.00	2.30	1.89	2.91	21.11
	Guarantee			*5.50*	*2.50*	*8.00*	*1.50*	*1.65*	*2.00*	*17.13*
4487	Swift's S. G. German Kainit	4487	.89						13.11	13.11
	Guarantee								*12.00*	*12.00*
	SWIFT & COMPANY, Chicago, Ill.									
4128	Swift's H. G. Tankage	4128	7.01				6.17	6.97		27.48
	Guarantee						*4.58*	*6.58*		*25.32*
	TENNESSEE CHEMICAL COMPANY, Nashville, Tenn.									
4312	H. G. Dissolved Bone	4312	10.93	9.45	3.91	13.36	1.21			14.31
	Guarantee			*8.00*	*6.00*	*14.00*	*1.00*			*14.80*
4313	Ox H. G. Ammoniated Bone	4313	11.95	7.94	4.58	12.52	.77	1.63	2.43	22.70
	Guarantee			*6.00*	*4.00*	*10.00*	*1.00*	*1.65*	*2.00*	*19.38*
4314	S. G. Cotton Guano	4314	8.79	7.20	4.74	11.94	1.37	1.48	1.47	20.50
	Guarantee			*6.00*	*4.00*	*10.00*	*1.00*	*1.65*	*1.00*	*18.38*
4315	S. G. Potash Mixture	4315	8.79	3.14	7.15	10.29	.68		2.21	13.84
	Guarantee			*6.00*	*4.00*	*10.00*	*1.00*		*2.00*	*13.60*
4316	S. G. Slaughter House Bone	4316	9.19	5.36	4.15	9.51	1.66	1.80	2.81	19.41
	Guarantee			*5.00*	*3.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.08*
	TENNESSEE VALLEY FERTILIZER CO., Florence, Ala.									
4437	S. G. Dissolved Bone	4437	7.20	[1]9.31	3.93	13.24	4.98			14.17
	Guarantee			*0.00*	*2.00*	*12.00*	*2.00*			*13.00*
4817	S. G. Ashcroft's Formula	4817	10.09	6.72	4.08	10.80	3.06		3.00	15.55
	Guarantee			*8.00*	*2.47*	*10.47*	*2.00*		*2.19*	*14.51*
4819	S. G. King Cotton Grower	4819	10.15	6.42	3.58	10.00	2.50	1.98	2.87	21.44
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*17.38*

4818 H. G. Florence Fertilizer	4818	17.15	6.43	3.65	10.08	2.68	1.82	2.84	20.94
Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*19.58*
Sold by THREEFOOT BROS. & Co., Meridian, Miss.									
4046 S. G. Prolific Acid Phosphate	4046	16.19	10.45	3.27	13.72	1.52			14.77
Guarantee			*11.00*	*2.00*	*13.00*	*1.00*			*14.10*
4204 Threefoot's H. G. English Acid Phosphate	4204	6.92	12.22	3.90	16.12	1.38			17.34
Guarantee			*13.00*	*2.00*	*15.00*	*1.00*			*16.30*
4047 Threefoot's Improved Mixture	4047	11.93	7.23	2.74	9.97	1.39	1.84	2.90	21.13
Guarantee			*7.50*	*2.00*	*9.50*	*2.00*	*1.67*	*1.50*	*18.55*
VIRGINIA-CAROLINA CHEMICAL COMPANY, Memphis, Tenn.									
4049 S. G. I. X. L. Acid Phosphate	4049	2.67	2.34	8.00	10.34	2.88			10.57
Guarantee			*9.00*	*3.00*	*12.00*	*2.00*			*12.90*
4050 S. G. Royal Acid Phosphate	4050	2.83	2.30	8.08	10.38	2.98			10.61
Guarantee			*10.00*	*2.00*	*12.00*	*2.00*			*13.00*
4051 Scott's H. G. Acid Phosphate	4051	4.36	8.12	4.42	12.54	3.40			13.35
Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*
4052 S. G. Eclipse Soluble Guano	4052	9.22	6.82	3.23	10.05	2.61	1.72	1.95	19.71
Guarantee			*7.00*	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*
4053 S..G. Mobile Double Eagle Guano	4053	6.54	6.61	2.84	9.45	1.65	1.82	2.39	19.82
Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.08*
4054 S. G. Mobile R. B. Ammoniated Superphosphate	4054	9.27	7.97	3.20	11.17	2.01	1.68	2.42	21.38
Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.08*
4055 S. G. Mobile Standard Guano	4055	9.19	6.53	2.79	9.32	2.32	1.71	2.21	19.10
Guarantee			*6.00*	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*17.73*
4056 S. G. Royal Animal Bone Guano	4056	9.31	7.00	3.18	10.18	2.62	1.79	1.36	19.52
Guarantee			*7.00*	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*
4057 S. G. Royal Blood, Bone and Potash	4057	9.57	7.91	3.25	11.16	1.92	1.73	1.84	20.96
Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.08*
4058 S. G. Royal Cotton Boll Guano	4058	9.44	6.21	3.15	9.36	2.07	1.74	2.22	19.23
Guarantee			*6.00*	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*17.73*
4059 S. G. Royal Compound	4059	5.22	1.76	7.62	9.38	2.14		2.21	12.70
Guarantee			*8.00*	*2.00*	*10.00*	*2.00*		*2.00*	*13.80*
4060 Royal H. G. Guano	4060	9.84	7.75	3.07	10.82	2.09	1.76	2.56	21.40
Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*19.58*
4061 H. G. Royal Potash Compound	4061	4.91	1.66	6.89	8.55	2.09		4.58	14.15
Guarantee			*8.00*	*2.00*	*10.00*	*2.00*		*4.00*	*15.80*
4062 H. G. Royal Vegetable Fertilizer	4062	8.82	6.48	3.02	9.50	1.51	2.30	4.52	23.67
Guarantee			*6.00*	*2.00*	*8.00*	*2.00*	*2.47*	*4.00*	*22.05*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1904-05

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
4063	S. G. Scott's Ammoniated Bone	4063	7.57	9.39	.93	10.32	1.04	1.93	1.56	20.61
	Guarantee			*7.00*	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*17.93*
4064	S. G. Scott's Gossypium Phospho	4064	7.16	6.68	2.31	8.99	1.36	1.84	2.01	19.01
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.08*
4065	H. G. Scott's Potasso Phospho	4065	8.75	4.49	7.41	11.90	1.87		2.40	15.94
	Guarantee			*9.00*	*3.00*	*12.00*	*2.00*		*2.00*	*16.10*
4066	S. G. Scott's State Standard Guano	4066	8.05	6.13	2.74	8.87	.95	1.90	2.49	19.51
	Guarantee			*6.00*	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*17.73*
4067	H. G. V.-C. Co.'s Truck Grower	4067	8.47	6.70	2.78	9.48	1.37	1.93	6.07	23.92
	Guarantee			*6.00*	*2.00*	*8.00*	*2.00*	*2.06*	*6.00*	*22.61*
4369	H. G. Virginia Carolina Guano	4369	11.99	8.43	2.51	10.94	1.92	1.98	2.23	22.04
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*19.58*
4068	S. G. German Kainit	4068	1.01						12.77	12.77
	Guarantee								*12.00*	*12.00*
	Wesson Cotton Oil & Fertilizer Co., Wesson, Miss.									
4527	H. G. Acid Phosphate	4527	9.71	11.44	5.21	16.65	1.92			17.79
	Guarantee			*12.00*	*3.00*	*15.00*	*1.00*			*16.20*
4424	H. G. Mutual Friend Mixture	4424	4.42	7.65	3.68	11.33	1.66	1.87	2.89	22.66
	Guarantee			*7.00*	*3.00*	*10.00*	*1.00*	*1.65*	*2.00*	*19.48*
4456	S. G. Mutual Friend Mixture	4456	11.48	8.71	2.36	11.07	.29	1.49	3.00	21.26
	Guarantee			*7.00*	*2.00*	*9.00*	*1.00*	*1.65*	*2.00*	*18.38*
4528	H. G. Mutual Vegetable Grower	4528	9.93	5.95	3.60	9.55	.85	2.79	5.48	26.35
	Guarantee			*5.00*	*2.00*	*7.00*	*1.00*	*3.00*	*4.00*	*22.70*
4529	S. G. German Kainit	4529	2.58						13.56	13.56
	Guarantee								*12.00*	*12.00*

Mississippi Agricultural Experiment Station.

BULLETIN No. 92.

FEEDING BEEF CATTLE IN MISSISSIPPI.

By ARCHIBALD SMITH and CHAS. I. BRAY.

AGRICULTURAL COLLEGE, MISS.,

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FEEDING BEEF CATTLE IN MISSISSIPPI.

BY

ARCHIBALD SMITH AND CHAS. I. BRAY.

The aim of this experiment was primarily to demonstrate that the feeding of beef cattle is profitable in this State and that good gains can be made under proper conditions of feeding and management.

The farmers of this State and throughout the cotton belt generally are slow to realize the benefits of stock raising and cattle feeding and that it is more remunerative than continuous cotton growing.

It is the desire of those connected with this experiment to illustrate in a practical way that the feeding of beef cattle in Mississippi is a safe and profitable investment and a much more economical way of maintaining the fertility of the soil than by purchasing fertilizers.

In addition to this we wished to ascertain whether cattle can be fed to better advantage in a stable where they are kept warm and dry and the manure is all saved or if the open yard system is preferable and also to compare a mixed ration of hay, cornmeal, wheat bran, cottonseed meal, and hulls with a ration of cottonseed meal and hulls alone.

It was the intention at first to compare a lot of scrub cattle of poor type and breeding with good grade cattle of a beef type, but, for reasons stated elsewhere, the experiment was not carried in full as was originally contemplated.

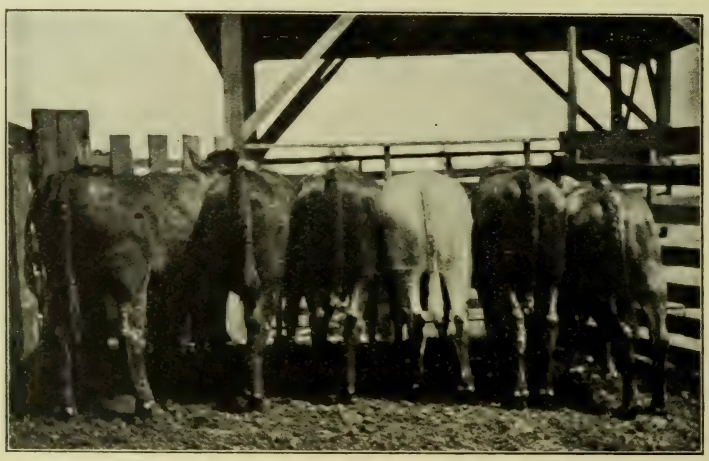
DESCRIPTION OF CATTLE.

Twenty-five steers were used in this experiment, eleven of which were grade Short-horns, thirteen grade Angus, and one grade Jersey. They were all in good thrifty condition when purchased, and with the exception of three steers, would be classed as medium feeders. Their ages ranged from two to four years old. Five of these steers were raised by the Experiment Station, three being two years old and

two four years old. The four year old steers were fairly well finished when the experiment was begun and consequently made very poor gains.

They were all valued at the cost of raising them—two cents per pound—and the profits estimated on that basis.

Eleven steers were purchased from Mr. C. N. Frye of Sessums, Miss., at three cents per pound. Ten of these were grade Angus two and one-half years old and one grade Short-horn four years old.



LOT I.

The grade Angus were one cross between a pure bred Angus bull and native grade cows.

Nine grade Short-horn steers were purchased from Mr. F. M. Abbott of Abbott, Miss., at four cents per pound. Six of these were two years old and three were three years old. There was little or no difference in the value of these two lots of cattle from a feeders standpoint and they all sold for the same price when finished. The difference in price paid was owing to the difficulty in securing a sufficient number and as Mr. Abbott did not wish to sell his cattle, but to finish them on his own farm, it was necessary to pay the higher price in order to get them.

If these steers had been purchased at the price of the others, it would have added considerably to the profits of feeding them.

Mr. Abbott and Mr. Frye both estimated the cost of raising their cattle at two cents per pound.

They had been kept on pasture during practically the whole of the time and had never been stable fed and were given very little extra feed during the winter.

As originally planned, the twenty-five steers were to be divided into five lots of five steers each. Lots Nos. 1, 2 and 3 to be fed in the stable, lot No. 4 in a yard with a small open shed for shelter, and lot No. 5 in an open yard without shelter.

Lot No. 1 to be fed on the mixed ration of corn, bran, hay, hulls and cottonseed meal. Lot No. 2 to be fed on cottonseed meal and hulls, and lot No. 3, of poor scrub character, to be fed the same as lot No. 1.

Lot II.

When the experiment was started it was found that twenty two of the cattle were too good to class any of them as scrubs, so lot No. 3 was made up of three steers. A typical poor feeder, a grade Jersey, and a young steer got by a Short-horn bull and one of the Station grade dairy cows.

This lot should be considered individually rather than collectively.

This arrangement left two steers to be accounted for, so they were included in lot No. 1, making seven in that lot. Each of the four lots were made up of cattle as nearly uniform in quality as possible.

Lot No. 4 was fed the mixed ration, and lot No. 5 was fed hulls and meal the same as lots Nos. 1 and 2 inside.

STABLE AND YARDS.

The stable used was built in an unused end of the Station mule barn where there was plenty of storage room overhead for feed, and which was as near the weighing scales as could be arranged. It was modeled after the stables commonly used in the North. The cattle were tied with chains in double stalls which were wide enough to allow them to lie down comfortably. They were only taken out to be weighed.

Fairly wide gutters were in the rear of the stalls to catch all the excrement both liquid and solid, and the stables were cleaned each day.

Metal lined water troughs were kept full of water in front of the cattle at all times except before being weighed. The feeding yards as first built were about 50 x 40 feet, but were enlarged to about twice that size during the second feeding period when, owing to bad weather, the yards had become excessively muddy. These cattle were supplied with water from a large trough extending half its length into each yard.

Each lot had a trough large enough to hold all their feed easily and around which they could all stand and eat.

FEEDS.

The hulls and cottonseed meal used in the experiment were purchased from the Starkville Cotton Oil Company and were always of good quality.

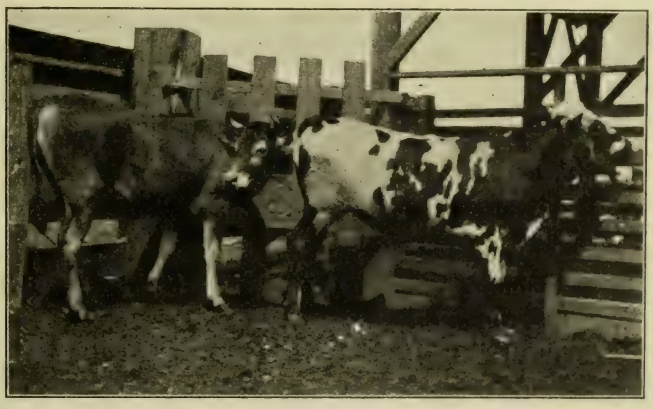
The hay used during the first two feeding periods was about two-thirds alfalfa and one-third Johnsongrass, but during the third feeding period only second class Johnsongrass hay could be obtained. The cornmeal used was the best storemeal and the wheat bran was of good quality.

COST OF FEEDS.

Cottonseed hulls	$ 4 25 per ton.
Cottonseed meal	20 50 per ton.
Hay (average cost)	9 00 per ton.
Corn meal	24 00 per ton.
Wheat bran	20 00 per ton.

PRELIMINARY FEEDING.

In order to have all the cattle on a uniform basis, before beginning the experiment, they were all placed in a large lot as they were delivered at the College and were fed for three weeks on hay, cottonseed hulls and meal. About a week before the experiment the cattle were



Lot III.

put into their respective lots in the stable and yards and fed on their regular rations until January 6th. In this way they became accustomed to their new feed and new quarters. The gains made were therefore uot reduced by excitement or nervousness which would be caused by a sudden change of feed or locality, and they were not artificially increased by "fill" such as would be the case if the cattle had been placed in their lots and the experiment begun immediately following their delivery at the College.

No attempt was made to fatten the cattle during this period, the object being to feed a maintenance ration and keep them in the

same condition as when purchased, and allow them to fill up thoroughly after the long drive to the College which most of them had.

In calculating the results, therefore, the cattle are valued at the same price per pound at the beginning of the experiment as was paid for them.

WEIGHING.

The cattle were weighed at the beginning of the experiment and at the end of each feeding period, making four times in all. The usual method of weighing for three consecutive days and averaging the weights was adopted. Weighing was begun about nine A. M., the water supply having been shut off at six P. M. the night before, thus preventing any animal filling up with water and apparently adding thirty to fifty pounds to his weight.

FEEDING PERIODS.

The cattle had to be weighed on scales outside in the yard and the three feeding periods were divided as nearly equal as weather and other conditions would permit.

The first feeding period includes thirty-four (34) days for the cattle in the stable and thirty-two (32) for those in the yard. The second period includes twenty-eight (28) days and the third thirty-four (34), for all lots.

They were fed twice a day at six A. M. and five P. M. The troughs were cleaned out each time before feeding and the waste feed weighed and recorded. The roughage—hay and hulls—were fed first then the meal which was thoroughly mixed with it.

The lots receiving cottonseed meal and hulls had their ration divided equally between two feeds, i. e., thirteen to fifteen (13-15) pounds of hulls and three to four (3-4) pounds of meal at each feed. Those receiving the mixed ration were given hulls in the morning and hay at night. During the first period three pounds of cottonseed meal was fed with the hulls and two pounds each of cornmeal and bran with the hay. In the second period two pounds each of cottonseed meal and bran were fed with the hulls and five pounds cornmeal with the hay.

In the third period the cornmeal fed at night was increased one pound daily up to ten pounds and two pounds cornmeal were fed

in the morning along with the two pounds of cottonseed meal and bran, making a total of twelve pounds of cornmeal per day.

The object in mixing the feeds was to induce the cattle to eat as much of the cheaper and coarse feeds as possible and also to get as much benefit from the cottonseed meal and corn as could be obtained by having the greater share of it pass into the first stomach (rumen) where it would be brought up and remasticated before passing on through the other stomach and intestines. This method of feeding gives very satisfactory results and is gaining in favor rapidly.

SHIPPING.

At the close of the experiment the cattle were driven to Starkville, a distance of one mile, for shipment to St. Louis. They were forty-eight (48) hours on the road and on arriving at the stock yards were divided into lots as they were fed. This was done to note the comments of the several buyers on the condition of the cattle and the difference in price offered if any.

LOT IV.

They were examined by expert buyers from three of the largest packing houses and with the exception of the small lot (No. 3), they decided there was practically no difference in the value and condition

of the several lots fed on different rations and under different conditions, consequently they all sold for the same price.

The quality and per cent. of dressed meat from each steer and the comments of the experts who scored the dressed carcasses in the cold storage afterwards proved that the buyers were correct in their decisions.

SALE OF CATTLE.

The cattle were all sold to Swift & Company for the highest price paid that day for southern cattle. They were the only firm that would consent to give a record of each individual steer relative to the per cent. of dressed meat and other information desired.

This work was done at considerable expense and inconvenience and those in charge of this experiment desire to express to Messrs. Swift & Company their appreciation and gratitude for the efficient manner in which the work was done and for the courtesy and information received.

WEIGHING AT ST. LOUIS.

In order to determine the amount of dressed beef from each individual steer, it was necessary to weigh each one separately on the large scales, which are intended for weighing a car load or more at once. This caused a loss of about ten pounds per head which does not occur with shipments that are not for educational purposes, and materially reduced our profits.

RESULTS.

The comparison of the two rations used; viz.: hay, cornmeal, wheat bran, hulls, and cottonseed meal, and cottonseed meal and hulls show conclusively that for economical and reasonably rapid gains cottonseed meal and hulls were decidly superior to the mixed ration.

We cannot say that the addition of another feeding stuff to the hulls and meal ration would not improve it.

The mixed ration used had greater variety but was also much heavier and more expensive. The corn and hay used was much more expensive than would be the case if they had been home grown and fed at cost price.

Lot No. 2, fed in the stable on cottonseed meal and hulls, made the cheapest gains, the average cost for the whole time being 6.1 cents

per pound. The best steer, see Fig. 7, having an average cost of 5.1 cents per pound of gain which was less than the price he sold for at St. Louis. As the carcass of this steer, see Fig. 9, was selected as the best of the whole lot, it would seem reasonably certain that the meal and hulls produced beef of as good quality as the corn, bran and hay ration.

LOT V.

The relative merits of stable vs. open yard feeding are shown to be almost identical with the results obtained at other Experiment Stations.

The stable fed steers made greater gains on less feed and in addition to this all the manure was saved which was no small item.

The steers in the open lot ate more feed and made almost as rapid gains as the stable fed cattle. They gained much more rapidly when the weather was fine and were less trouble to care for.

During the bad weather of February the yard fed steers gained only a little over one pound per day, (Lots Nos. 4 and 5, 2nd period),

while lot No. 1 in the same time gained over twice as much. The next month, however, lot No. 4 gained over three pounds each day as compared with about two pounds per day for lot No. 1, thus making the total gains about the same.

The increased cost per pound of gain by feeding in the open yard was from .6 cents to 2 cents per pound. The reason why lot No. 4 compares so favorably with lot No. 1, both fed on the same ration while lot No. 5 is so far behind lot No. 2 fed the same ration, is due only to the shed roof over part of the yard occupied by lot No. 4 and the greater comfort of the cattle, showing the value of even partial shelter.

BEEF vs. DAIRY SIRES FOR PRODUCING GOOD FATTENING STEERS FROM DAIRY COWS.

This is only a single trial between the two small steers grouped together in lot No. 3, see Fig. 5, and cannot be called an experiment. Nos. 29 and 14 weighing 580 and 590 pounds and sired by a Short-horn and Jersey bull respectively out of native cows of dairy type. No. 29 gained about one and three-fourths pounds per day at a cost of 7.6 cents per pound, while No. 14 gained less than one pound per day at a cost of 12.78 cents per pound. At St. Louis they were sold together at $4.25 per hundred weight, but it was the decision of the buyers that there was a difference of at least fifty to seventy-five cents per hundred in the value of the two. Assuming then that two cents per pound represents fairly the cost of raising them up to January 6th, the Short-horn cross, No. 29, made a profit of about $7.00 while the Jersey, No. 14, barely paid for his feed.

This matter is only dealt with here to illustrate the value of good beef blood in steers intended for fattening.

MANURE FROM STABLE FED CATTLE.

The manure from the stable fed cattle was saved for the purpose of conducting some crop experiments with hay and cotton, the results of which will be reported by Mr. Perkins.

We hope in this way to demonstrate in a practical manner the value of the manure as shown by its effect on these two staple crops.

No special care was taken of the manure as it was thrown into the yard in large heaps and drawn to the fields as it accumulated.

Most of the loads were weighed while some were measured and it was estimated that forty tons of very rich manure were saved. This, if valued at $2.00 per ton, would make a total value of $80.00. To show the total theoretical value of the manure from the food stuffs given the fifteen steers, we quote the table of manurial values given in Mississippi Experiment Station bulletin No. 60, "The Value of Cotton Seed to the Farmer."

GOOD TYPE OF STEER TO FEED.

FEEDING STUFF.	MANURIAL VALUE PER TON.	VALUE OF MANURE FROM ONE TON.
Corn	$ 5 65	$ 4 80
Cottonseed meal	22 50	19 13
Cottonseed hulls	2 99	2 54
Wheat bran	11 17	9 47
Johnsongrass hay	4 24	3 60

Valuing the manure on this basis we have:

Manure from 5247 lbs. corn	$ 12 59
Manure from 4975 lbs. cottonseed meal	47 56
Manure from 23675 lbs. cottonseed hulls	30 07
Manure from 1743 lbs. wheat bran	8 26
Manure from 8010 lbs. hay (estimated as Johnsongrass hay)	14 42
Total	$ 112 90

This shows that in our former estimate we have allowed for about one-third waste in the value of the manure.

That fattening cattle for market is profitable in Mississippi there is no reason to doubt. We have made a good profit on these steers in spite of hindrances rendered necessary in the course of the experiment which would not be encountered by the ordinary feeder. The extra price paid for the grade Short-horn cattle and the loss in weight (on the whole lot) when selling, in order to get the information we desired, materially reduced our profits. Then had the cattle been shipped three days earlier as had been intended immediately following the last weighing, they would have sold for six cents per pound instead of 5.15 cents which alone would have made a difference of $175.00 in the receipts from the best cattle. If the grade Short-horns had been purchased at three cents as were the other cattle, $78.00 would have been added to the profits.

As has been mentioned elsewhere, Messrs. Abbott and Frye agree with the investigations carried on at this Station that these cattle can be raised at a cost of two cents per pound.

Had a farmer raised all of these cattle and finished them at home, his profits might have been as follows:

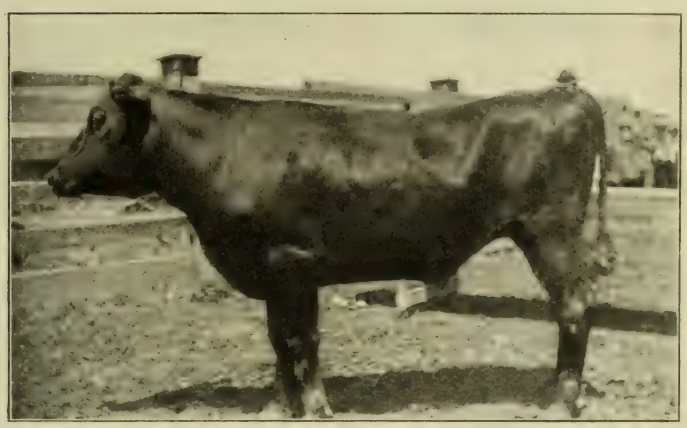
Value of cattle, 21,317 pounds @ 2c	$ 426 34
Cost of feed	367 25
Freight	63 00
Total	$ 856 59
By receipts for cattle	$1189 66
By Balance, profits	333 07

FINANCIAL STATEMENT.

LOT NO. 1.

To 4 steers weighing 3595 lbs. @ 3c	$107 85		
3 steers weighing 2427 lbs. @ 4c	97 08		$204 93
	PER TON.		
8603 lbs. hulls @	$ 4 25	18 28	
3903 lbs. cornmeal @	24 00	46 84	
5989 lbs. hay @	9 00	26 95	
1490 lbs. C. S. meal @	20 50	15 27	
1278 lbs. wheat bran @	20 00	12 78	120 12
			$325 05

By 6 steers, 6044 lbs. @	5.15c	$311 27	
1 steer, 790 lbs. @	4.25c	33 57	344 84
Balance			$ 19 79



UNDESIRABLE TYPE TO FEED.

LOT NO. 2.

To 2 steers, 1631 lbs. @ 2c		$ 32 62	
1 steer , 820 lbs. @ 3c		24 60	
2 steers, 1627 lbs. @ 4c		65 58	$122 30
PER TON.			
1261 lbs. hulls @	$ 4 25	25 63	
2939 lbs. C. S. meal @	20 50	30 12	55 75
			$178 05
By 5 steers, 4612 lbs. @	5.15c	$237 51	
Balance			$ 59 46

LOT NO. 3.

To 2 steers, 1170 lbs. @ 2c		$ 23 40	
1 steer , 822 lbs. @ 3c		24 66	$ 48 06

	PER TON.		
3009 lbs. hulls @	$ 4 25	$ 6 39	
2021 lbs. hay @	9 00	9 09	
1334 lbs. cornmeal @	24 00	16 05	
546 lbs. C. S. Meal @	20 50	5 89	
465 lbs. wheat bran @	20 00	4 65	41 73
			$ 89 79
By 3 steers, 2200 lbs. @ 4.25c		$ 93 50	
Balance			$ 3 71

LOT NO. 4.

To 3 steers 2590 lbs. @ 3c		$ 77 70	
2 steers, 1765 lbs. @ 4c		70 60	$148 30
	PER TON.		
6479 lbs. hulls @	$ 4 25	$ 13 77	
4525 lbs. hay @	9 00	20 36	
1890 lbs. cornmeal @	24 00	34 92	
1091 lbs. C. S. meal @	20 50	11 18	
931 lbs. wheat bran @	20 00	9 21	$ 89 54
			$237 84
By 5 steers, 4837 lbs. @ 5.15c		$249 10	
Balance			$ 11 26

LOT NO. 5.

To 2 steers, 1865 lbs. @ 3c		$ 55 95	
2 steers, 1995 lbs. @ 4c		79 80	
1 steer , 1010 lbs. @ 2c		20 20	$155 95
	PER TON.		
13075 lbs. hulls @	$ 4 25	$ 27 78	
5154 lbs. C. S. meal @	20 50	$ 32 33	$ 60 11
			$216 06
By 5 steers, 5140 lbs. @ 5.15c		$264 71	
Balance			$ 48 65

RECAPITULATION.

Total cost of cattle	$679	54	
Total cost of feed	367	25	
Freight on cattle to St. Louis	63	00	$1109 79
By Receipts for cattle	$1189	66	
Net profits			79 87

In placing the net profits at $79.87, it is considerably lower than would have been the case had the cattle been handled on a strictly commercial basis.

The value of the manure, $80.00, we estimate would cover the cost of labor and waste feed.

BEST CARCASS.

CARCASS OF JERSEY STEER—
NOT GOOD.

In Mississippi where cotton growing has been the chief source of revenue for the farmer, other branches of agriculture have not been developed extensively.

In the wheat and corn belts, farmers have long ago discovered that the continuous sale of their crops could not be carried on indefinitely without impairing the fertility of the soil and that they must have recourse to live stock of some kind to return to the land some of the elements of plant food taken from it by the crops grown, thus preserving their farms in a state of productivity more nearly resembling the original condition of the soil. In the cotton belt the beef breeds of cattle are only beginning to take their rightful place among other farm live stock. This is largely owing to the prevailing idea among farmers that raising beef steers for market is not profitable.

Dairy farming has many points of superiority over beef raising, but to farmers who are not close to a good market and are handicapped by lack of available and steady labor, the breeding and feeding of cattle will offer many inducements.

That it is a profitable business in the South is shown by the low cost of raising cattle, economy in producing suitable feeds, and the inexpensive buildings required.

With a good pure-bred beef sire, a herd of native cows, and plenty of pasture land, a farmer may in two or three years time develop a good grade beef herd, which will largely increase his profits and maintain the fertility of the soil.

The comparison between the stable vs. open yard system while showing some advantage in favor of the stable method really indicates that a combination of the best features of both systems is preferable. This could be done by allowing the cattle to run in large sheds with a solid tight floor which should be well bedded, and the manure all saved. If desired, outside yards connected with these sheds could be provided, so that the cattle could have some exercise and plenty of fresh air. One of the secrets of successful cattle feeding is in making them as comfortable as possible.

Where ccottonseed meal and hulls can be purchased at a reasonable price, they prove to be very cheap feeds for fattening steers. No bad effects result from feeding cottonseed meal for such short periods as this, and it remains to be seen whether any ration can be compounded exclusive of good silage, which can equal it as an inexpensive feed.

LOT I.—7 steers. Stall fed on mixed ration.

Total weight, 6022 lbs.

Average weight, 860.3 lbs.

Period.	Wt. of Lot at end of Period.	Average Weight.	Lbs. Gain.	Av. gain per steer per day	Feed Eaten.	Cost of Feed.	Cost per day per steer.	Cost per lb. gain.
1. Jan. 6 to Feb. 8 34 days	6545	935	532	2.1	Hulls, 3138 lbs. Hay, 2285 lbs. Corn, 458 lbs. C.S.Meal 670 lbs. Bran, 458 lbs.	$ 33.74	14.3c	6.4c
2. Feb. 9 to Mar. 8 28 days	6945	992	400	2.04	Hulls, 2529 lbs. Hay, 1800 lbs. Corn, 921 lbs. Meal, 378 lbs. Bran, 378 lbs.	32.27	16.4c	8.04c
3. Mar. 9 to Apr. 11 34 days	7429	1061	484	2.03	Hulls, 2936 lbs. Hay, 1904 lbs. Corn, 2524 lbs. Meal, 442 lbs. Bran, 442 lbs.	54.11	22.9c	11.6c
Totals Average			1407 201	2.09		$120.12	17.8c	8.5c

LOT 2.—5 steers stall fed on meal and hulls.

Total weight, 4078 lbs.

Average weight, 815.6 lbs.

Period.	Wt. of Lot at end of Period.	Average Weight.	Lbs. Gain.	Av. gain per steer per day	Feed Eaten.	Cost of Feed.	Cost per day per steer.	Cost per lb. gain.
1. 34 days	4395	879	317	1.87	Hulls, 4422 lbs. Meal, 975 lbs.	$ 19.39	11.4c	6.1c
2. 28 days	4647	929.4	252	1.8	Hulls, 3333 lbs. Meal, 797 lbs.	$ 15.28	10.9c	6c
3. 34 days	4988	997.6	341	2.–|–	Hulls, 4306 lbs. Meal, 1167 lbs.	$ 21.08	12.4c	6.2c
Totals Average			910 185	1.93		$ 55.75	11.61c	6.1c

LOT 3.—3 poor steers. Stall fed on mixed ration.
Total weight, 1992 lbs.
Averageweight, 664 lbs.

Period.	Wt. of Lot at end of Period.	Average Weight.	Lbs. Gain.	Av. gain per steer per day	Feed Eaten.	Cost of Feed.	Cost per day per steer.	Cost per lb. gain.
1. Jan. 6 to Feb. 8 34 days	2103	701	111	1.09	Hulls, 1144 lbs. Hay, 713 lbs. Corn, 173 lbs. Meal, 254 lbs. Bran, 173 lbs.	$ 12.02	11.8c	10.8c
2. Feb. 9 to Mar. 8 28 days	2200	733	97	1.15	Hulls, 873 lbs. Hay, 630 lbs. Corn, 321 lbs. Meal, 134 lbs. Bran, 134 lbs.	$ 11.26	13.4	11.6c
3. Mar. 9 to Apr. 11 34 days	2382	794	182	1.78	Hulls, 992 lbs. Hay, 678 lbs. Corn, 840 lbs. Meal, 158 lbs. Bran, 158 lbs.	$ 18.45	18.1c	10.1c
Totals			390			$ 41.73		
Average			130	1.35			14.5c	10.7c

LOT 4.—5 steers fed in open lot with shelter on mixed ration.
Total weight, 4355 lbs.
Average weight, 871 lbs.

Period.	Wt. of Lot at end of Period.	Average Weight.	Lbs. Gain.	Av. gain per steer per day	Feed Eaten.	Cost of Feed.	Cost per day per steer.	Cost per lb. gain.
1. Jan. 8 to Feb. 8 32 days	4655	931	300	1.87	Hulls, 2255 lbs. Hay, 1560 lbs. Corn, 320 lbs. Meal, 480 lbs. Bran, 390 lbs.	$ 23.77	14.84c	7.9c
2. Feb. 9 to Mar. 8 28 days	4808	961.6	153	1.09	Hulls, 1980 lbs. Hay, 1350 lbs. Corn, 700 lbs. Meal, 275 lbs. Bran, 275 lbs.	$ 24.23	17.31c	15.8c
3. Mar. 9 to Apr. 11 34 days	5335	1067	527	3.1	Hulls, 2224 lbs. Hay, 1615 lbs. Corn, 1890 lbs. Meal, 336 lbs. Bran, 336 lbs.	$ 41.54	24.41c	7.87c
Totals			980			$ 89.54		
Average			196	2.085			18.6c	9.13c

LOT 5.—5 steers fed in open lot without shelter on cottonseed meal and hulls.
Total weight, 4870 lbs.
Average weight, 974 lbs.

Period.	Wt. of Lot at end of Period.	Average Weight.	Lbs. Gain.	Av. gain per steer per day	Feed Eaten.	Cost of Feed.	Cost per day per steer.	Cost per lb. gain.
1. Jan. 8 to Feb. 8 32 days	5176	1035.2	306	1.8	Hulls, 4590 lbs. Meal, 960 lbs.	$ 19.59	12.24c	6.4c
2. Feb. 9 to Mar. 8 28 days	5331	1066.2	155	1.1	Hulls, 3960 lbs. Meal, 890 lbs.	$ 16.98	12.12c	11.c—
3. Mar. 9 to Apr. 11 34 days	5599	1119.8	268	1.58	Hulls, 4660 lbs. Meal, 1330 lbs.	$ 23.54	13.83c	8.78c
Totals			729			$ 60.11		
Average			146	1.52			12.8c	8.2c

TABLE II.

Table I in Extended Form, Showing Individual Gains of Steers.

LOT 1.

Steer No. and Weight.	Feeding Period.	Weight at end of Period.	Lbs. Gain.	Average gain per day.	Value of feed eaten.	Cost per day.	Cost per lb. gain.	Per cent. of dres'd meat.
219	1st	925	67	2.—	$ 4.57	13.44c	6.82c	
	2nd	980	55	2.—	4.23	15.1	7.7c	57.2
Wt. 858	3rd	1079	99	2.9	7.86	23.1	7.94c	
Total and Average			221	2.3	$ 16.66	17.35c	7.54c	
202	1st	945	78	2.3—	$ 4.73	13.9c	6.06c	
	2nd	1000	55	2.—	4.48	16.c	8.14c	60
Wt. 867	3rd	1085	85	2.5	7.91	23.3c	9.36	
Total and Average			218	2.27	$ 17.12	17.83c	7.84c	
131	1st	870	50	1.47	$ 5.12	15.06c	10.24c	
	2nd	925	55	2.	4.77	17. c	8.67c	55.2
Wt. 820	3rd	990	65	1.91	8.18	24.x c	12.58c	
Total and Average			170	1.77–|–	$ 18.07	18.82c	10.63c	
126	1st	998	76	2.24	$ 5.14	15.12c	6.77c	
	2nd	1055	57	2.04—	4.80	17.14c	8.42c	
Wt. 922	3rd	†1088	33	.97	7.43	21.85c	22.51c	
Total and Average			166	1.73	$ 17.37	18.1 c	10.46c	

LOT 1—CONTINUED.

STEER No. and WEIGHT.	Feeding Period.	Weight at end of Period.	Lbs. Gain.	Average gain per day.	Value of feed eaten.	Cost per day.	Cost per lb. gain.	Per cent. of dres'd meat.
128	1st	755	70	2.06	$ 4.37	12.85c	6.24c	
	2nd	795	40	1.53	3.95	14.1 c	9.88c	57.8
Wt. 685	3rd	855	60	1.77—	6.30	18.5 c	10.5 c	
Total and Average			170	1.77	$ 14.62	15.23c	8.96c	
133	1st	1012	112	3.3—	$ 4.96	14.3c–	4.43c	
	2nd	1075	63	2.25	4.99	17.82c	7.92c	56.9
Wt. 900	3rd	1140	65	1.91–|–	8.18	24.c–|–	12.58c	
Total and Average			240	2.5	$ 18.13	18.9 c	7.55c	
132	1st	1040	70	2.04	$ 4.99	14.7 c	7.13c	
	2nd	1115	75	2.68	5.05	18.c–|–	6.73c	
Wt. 970	3rd	1192	77	2.26x	8.25	24.26c	10.71c	
Total and Average			222		$ 18.29	19.05c	8.69c	
Grand Tot. and Av.			1407	2.09	$ 120.26	17.8 c	8.5 c	

LOT 2.

STEER No. and WEIGHT.	Feeding Period.	Weight at end of Period.	Lbs. Gain.	Average gain per day.	Value of feed eaten.	Cost per day.	Cost per lb. gain.	Percent. of dres'd me't
130	1st	949	87	2.55	$ 4.26	12.65c	4.9 c	
	2nd	1020	71	2.54	3.36	12.c	4.73c	57.4
Wt. 862	3rd	1105	85	2.5	4.75	14.c	5.59c	
Total and Average			243	2.53x	$ 12.37	12.9c	5.1c–	
122	1st	840	75	2.2	$ 4.06	12.c—	5.41c	
	2nd	897	57	2.04	3.16	11.3 c	5.54c	58.
Wt. 765	3rd	960	63	1.85	4.27	12.6 c	6.8 c	
Total and Average			195	2.03	$ 11.49	12.c—	5.9 c	
226	1st	890	70	2.06	$ 3.98	11.7 c	5.7 c	
	2nd	950	60	2.14	3.12	11.14c	5.2 c	
Wt. 820	3rd	994	44	1.3	4.21	12.4 c	9.6 c	
Total and Average			174	1.81	$ 11.31	11.78c	6.56c	
34	1st	†981	26	.77—	$ 3.60	10.6 c	13.9 c	
	2nd	1015	34	1.21	2.98	10.74c	8.76c	56.3
Wt. 955	3rd	1089	74	2.18	4.27	12.56c	5.76c	
Total and Average			134	1.39	$ 10.85	11.3 c	8.1 c	
129	1st	735	59	1.74	$ 3.49	10.26c	5.9c	
	2nd	765	30	1.07	2.62	9.4 c	8.73c	55.5
Wt. 676	3rd	840	75	2.21	3.58	10.53c	4.8 c	
Total and Average			164	1.71	$ 9.69	10.1 c	5.84c	
Grand Tot. and Av.			910	1.93	$ 55.71	11.61c	6.2 c	

LOT 3.

Steer No. and Weight.	Feeding Period.	Weight at end of Period.	Lbs. Gain.	Average gain per day.	Value of feed eaten.	Cost per day.	Cost per lb. gain.	Per cent. of dres'd meat.
29	1st	637	57	1.68	$ 3.89	11.44c	6.82c	
	2nd	670	33	1.18	3.47	12.4 c	10.52c	55.
Wt. 580	3rd	750	80	2.35	5.65	16.6 c	7.06c	
Total and Average			170	1.77	$ 13.01	13.55c	7.65c	
14	1st	611	21	.62	3.45	10.75c	16.43c	
	2nd	690	29	1.03	3.20	11.42c	11.03c	52.2
Wt. 590	3rd	683	43	1.26	5.24	15.41c	12.18c	
Total and Average			93	.97	$ 11.89	12.38c	12.78c	
216	1st	855	33	.97	$ 4.68	13.76c	14.18c	
	2nd	890	35	1.25	4.59	16.4 c	13.11c	50.6
Wt. 822	3rd	949	59	1.73	7.55	22.21c	12.8 c	
Total and Average			127	1.32	$ 16.82	17.52c	13.25c	
Grand Tot. and Av.			390	1.35	$ 41.72	14.5 c	10.7 c	

LOT 4.

Steer No. and Weight.	Feeding Period.	Weight at end of Period.	Lbs. Gain.	Average gain per day.	Per cent. of dres'd meat.
205	1st	930	100	3.12 lbs.	
	2nd	960	30	1.07	57.3
Wt. 830	3rd	1075	115	3.38	
Total and Average			245	2.6	
212	1st	970	20	.625	
	2nd	983	13	.465	59.5
Wt. 950	3rd	1081	98	2.9	
Total and Average			131	1.4	
135	1st	1090	55	1.72	
	2nd	1125	35	1.25	58.7
Wt. 1035	3rd	1230	105	3.1	
Total and Average			195	2.-|-	
134	1st	830	100	3.12	
	2nd	870	40	1.93	58.5
Wt. 730	3rd	972	102	3.0	
Total and Average			242	2.57	
121	1st	835	25	.78	
	2nd	870	35	1.25	
Wt. 810	3rd	977	107	3.15	
Total and Average			167	1.78	
Grand Total and Av.			980	2.085	

LOT 5.

Steer No. and Weight.	Feeding Period.	Weight at end of Period.	Lbs. Gain.	Average gain per day.	Per cent. of dres'd meat.
233	1st	950	60	1.88	
	2nd	995	45	1.6	
Wt. 890	3rd	1085	90	2.64	59.5
Total and Average			195	2.07	
35	1st	1040	30	.94	
	2nd	1059	19	.7	59.
Wt. 1010	3rd	1093	34	1.	
Total and Average			83	.98	
136	1st	1105	70	2.2	
	2nd	1130	25	.9	59.
Wt. 1035	3rd	1175	45	1.3	
Total and Average			140	1.5	
137	1st	1040	80	2.4	
	2nd	1082	42	1.5	56.
Wt. 960	3rd	1145	63	1.85	
Total and Average			185	1.97	
209	1st	1041	66	2.06	
	2nd	1065	24	.86	58.2
Wt. 975	3rd	1101	36	1.06	
Total and Average			126	1.34	
Grand Totals and Av.			729	1.55 lbs.	

Mississippi Agricultural Experiment Station.

BULLETIN No. 93.

PEACH AND PLUM CULTURE.

By A. B. McKAY.

Desirable Shape for Tree.

AGRICULTURAL COLLEGE, MISSISSIPPI,

September, 1905.

TUCKER PRINTING HOUSE, JACKSON, MISS.

PEACH AND PLUM CULTURE.

By A. B. McKay.

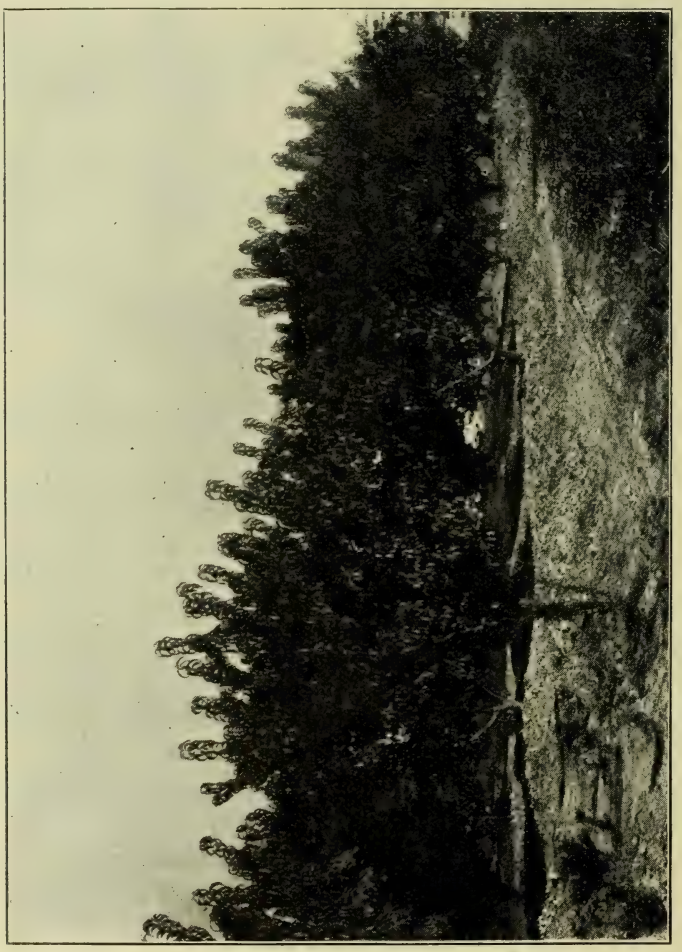
Aspect.—During November, 1897, a nine-acre piece of hill land was selected for Station work with peaches and plums. About two acres of nearly level land lying in the northwest corner of this plat forms the summit of the hill. From this eminence the surface slopes gently to the south, but more abruptly to the east and to the southwest, toward the valley which runs around the hill. This gives a good exposure to the sun during the entire day.

Soil.—Of the two acres of nearly level land approximately one acre in the extreme northwest corner is a stiff, heavy clay over a light colored, sticky, poorly drained subsoil. Circling around this, from east to southwest, and extending about half way down the hill, is a zone or belt of deep, strong clay loam over an orange colored clay subsoil. Around this, and extending almost to the foot of the hill, is a similarly shaped strip including the remaining orchard land. The soil in the middle section of this strip is of a light grayish color, somewhat more porous than that further up the hill. Toward each end of this last strip the soil merges into a thin reddish clay over a deeper red subsoil.

Preparation of Land.—For several years before planting to trees, cotton and corn had occupied the better portion of the land. The rest had grown up in weeds and bushes. But little effort had been made to control surface water; consequently, several gullies of considerable size and length had formed in the hill side.

The first work done was that of grubbing, filling up ditches, and grading down bumps and uneven surfaces. This accomplished, the soil was deeply broken with a two-horse turn plow. The disc harrow and the smoothing harrow followed reducing clods and thoroughly pulverizing the soil to a considerable depth, leaving the surface as smooth and even as possible.

Trees and planting.—Of the nine acres in orchard, six were given to the commercial section, which embraced nine hundred Elberta and fifty Triumph peach trees. The remaining three acres were devoted to variety work with peaches and plums. Excepting about two-thirds



A Little of the Orchard.

of an acre in Elbertas near the top of the hill, the commercial section occupies the lower land. Healthy, one-year, budded trees about four feet high were used.

Planting began January 3, 1898, The method was as follows: The distance between each two rows of trees was approximately,

eighteen feet, and the distance between each two trees in the row seventeen feet. On the nearly level land the trees were set in straight rows. On the hillside the rows were circled round the hill. "Circling" was done as follows: Beginning near the lower side of the orchard a line of stakes was so placed as to indicate the general course of the first row of trees. For the sake of convenience we will call this row of stakes a "guide line." Moving the leveling instrument further up the hill, a second guide line of stakes was set; then the third, and so on until the upper limit of the hillside was reached. The difference in level between each two guide lines was four feet. The fall of each line from the upper to the lower end was the same as that indicated above for tree rows.—eight inches to each hundred feet. The guide lines being placed, the next step was that of making proper openings for setting the trees. This was accomplished with a two-horse turn plow. Beginning at the upper end of the first guide line the plow followed the general direction of the stakes to the lower end, and returned to the upper end in the same furrow, thus opening a deep, broad trench with a good quantity of loose earth on each side. To get the proper distance for the second row of trees a rod eighteen feet long was held between two men, the first man walking down the trench just made, the second keeping pace at the other end of the rod. The plow followed immediately behind the second man and returned in the same furrow to the upper end, thus completing the trench for the second row of trees. Remembering that the difference of level between each two guide lines was four feet it must be evident that where the slope of the hill is abrupt the distance between guide lines will be short, and that on the more gentle slopes the distance will be greater. To preserve the required fall in the tree rows—eight inches to the hundred feet—on such varying surfaces, short rows must be added here and there as necessity dictates. Good judgment, of course, must be exercised in this matter of placing intermediate rows, just as in each and every other detail in orchard work. Approaching the second guide line the tree row which happens to start just below or just above it should be run approximately parallel to it. Taking this second guide line as a starting point for another series of tree rows, work of placing the latter continues throughout the hill section of the orchard as indicated between the first and second guide lines.

Just before planting each tree was carefully inspected for borers, and its roots were nicely pruned to four to six inches in length. Careful droppers spaced the trees properly in the rows. Where absolute accuracy is required, it is only necessary to place a rod of the required

length between two men, the one behind indicating where the last tree was dropped, the one in front placing a tree at the other end of the rod. Men followed immediately behind the droppers; and, with their hands, worked nicely pulverized soil among the roots, firmly pressing it about the tree. Two or three trips on each side of the row with a one-horse turn plow finished the work of planting, leaving the trees on slightly elevated beds, and a little deeper in the soil than they stood in the nursery row.

Cultivation and cropping.—During the first season a space of three and one half feet on each side of the rows was left for cutilvating the trees. The remaining space, eleven feet between each two tree rows, was planted to sweet potatoes. From the very start, and during the entire growing period the first year, the trees were cultivated as often as was necessary to keep the soil free from grass and weeds and in the best tilth. The deep and thorough preparation before planting enabled the trees to establish their root system several inches below the surface of the soil. This, I consider, a most important matter in orchard work. Once the larger roots become fixed at a good depth in the soil, the trees are much less subject to extremes of wet and dry weather, and deep cultivation, when necessary, may be done without injury to the roots.

The yield in potatoes approximated one hundred bushels to each acre in trees. Immediately after harvesting potatoes the entire orchard was planted to oats and vetch, the soil being nicely ridged to the trees, leaving an open furrow midway between each two rows for surface drainage. Early in the spring of 1899 this cover crop was plowed under. During the second season cultivation was done mainly with the disc harrow until the middle of July, when the orchard was planted broadcast to cowpeas. The growth of vines was vigorous and the yield of peas averaged twenty bushels per acre. During the second winter the decaying peavines served as a surface cover. Since the end of the second season the trees have so completely occupied the land that further cropping was deemed unnecessary. For the most part cultivation has contiuned, during subsequent seasons, with disc and smoothing harrows. Constant use of harrows tends to level the surface; so that, in order to control surface water, it has been necessary each fall, prior to the heavy winter rains, to ridge the soil to the trees with turn plows.

Pruning and fruitage.—Endeavoring to develop trees with low, spreading, open tops, the first pruning was done just before the newly planted trees started into growth. Each tree was reduced to a single

stem from ten to fifteen inches in height. When the buds along these stems had pushed into vigorous growth, six to ten inches long, three to five of the best branches near the top were left to grow, the others being removed. From time to time during the first spring and summer, growth was directed by simply pulling or cutting out surplus branches and by pinching out the tips of such branches as extended beyond proper limits, thus stopping them, and throwing more food to the weaker parts of the tree. On good soil in our latitude, most varieties of peaches and plums will develop more wood during the early life of the tree than the roots can maintain in a healthy condition. At the close of the first season the trees averaged fully six feet in height.

The pruning which trees should receive at the close of the first year in the orchard is, possibly, the most important in the life of the orchard. The three to five branches which were started the previous spring near the ground had, by the following fall, become strongly attached to the much thickened trunk from which they had grown. Swinging out from strong, hinge-like crotches (not forks), these branches formed the frame work, so to speak, upon which to build the future tree. After the leaves had fallen, and before freezing weather, these branches were cut back one-third to one-half their length, and the side branches, or latterals, were properly thinned, and, where too vigorous, somewhat shortened.

The unusually mild weather which prevailed during late January and early February of 1899 was followed by a blizzard, the mercury on February 12th, dropping to nine degrees below zero. A few days later the bark on the lower parts of the tree trunks was found to be very much darkened in color; and, from the surface of the ground almost to the crotches of the lower branches, had so separated from the sap wood that it might be easily pulled away from the tree by the hand. As soon as the cold was passed the entire orchard was severely pruned, the branches being cut back to mere stubs only a few inches in length. This heading back enabled the well developed root system to concentrate its energy on a very limited wood surface above ground. By mid-summer not a trace of damage from the cold could be seen; and the end of the growing season found the tree trunk and the branches attached greatly increased in size and strength, and the tops, or heads, of the trees symmetrical and well developed.

The work of pruning the second fall was essentially the same as that of the first. The main branches of the current year's growth were shortened to about half their length, and the fruit-bearing wood was so pruned as to leave it nicely distributed throughout the entire

head of the tree. It might be well to note just here that the kind and the amount of pruning necessary from year to year must be governed by circumstances. Some varieties require more pruning than others. Seasons when there is little or no fruit there is a greater development of wood than during years of heavy fruit bearing. Less wood is developed on thin than on strong soils. The wood growth is greater during wet than during dry seasons. Remembering that peach and plum trees usually develop too much fruit-bearing wood, and that from the crop of fruit buds formed *this summer and fall* must come the fruit of *next year*, the orchardist, at the close of each season's growth or just before vegetation begins the following spring, should endeavor to so prune each tree as to maintain a proper balance between wood growth and fruit bearing.

During the past three years most of the pruning in the Station orchard has been done during late winter or just before growth began in the spring. During the spring of 1903 cold weather killed the fruit crop. The following season being exceedingly favorable for tree growth, entirely too much wood was developed. The following spring experiments were made with thinning fruit in connection with more or less severe pruning. In the commercial section alternate rows were closely pruned. In the variety section alternate trees in the row were similarly treated. Thinning began when the peaches were about two-thirds as large as an average size peach seed. Plums were thinned when somewhat smaller. By that time most of the defective fruit could be detected. On some trees no fruit was removed; on others only a small percentage was taken; on still others considerably more than half was pulled off. In thinning, the fruit was nicely spaced along the branches and well distributed throughout the entire head of the tree.

RESULTS OF PRUNING: Size and uniformity of fruit, health and vigor of foliage, quantity and quality of new wood growth were alike greatly in favor of the closely pruned trees. Recuperation after the fruit harvest was more certain and more prompt on the closely pruned trees than on the others.

RESULTS FROM THINNING: Much the largest percentage of small and defective fruit was found on the unthinned trees. The yield of salable fruit was greatest on the moderately thinned and moderately pruned trees. The largest percentage of fancy, high priced fruit was taken from the trees closely thinned and closely pruned. The healthiest and, in every way, the best trees now in the orchard are those which have been rather severely pruned and which have not been permitted

to bear too heavily. In the system of pruning outlined, the annual heading back tends to develop short, stocky strong lower branches with similar side branches; trees which will support, without splitting or breaking down, more fruit than they should be permitted to bear. During seasons of heaviest fruitage we have used no props or supports of any kind.

Gathering, packing and shipping.—The commercial orchard has produced three crops of peaches; the first in 1901, the second in 1902 the third in 1904. In 1901 the yield, for the size and age of the trees, was good; but, owing to the very severe drouth, which began several weeks before the harvest and prevailed until fruit was gone, peaches were small, poorly colored and of inferior quality. In 1902, with more favorable weather, fruit was better and higher prices prevailed. Last season the yield was excellent and prices satisfactory.

In gathering we endeavor to go over the orchard sufficiently often to get the fruit as fast as it reaches the proper stage for shipping; that is, when it is well colored and yet firm enough to be handled without bruising. Half bushel baskets with strong handles are used in gathering. Each peach is carefully pulled and placed in the basket as gently as if it were an egg. As the baskets are filled they are placed on spring wagons and carried at once to the packing shed. Here the fruit is graded and properly packed for shipment, the better grades going in the six-basket crate—a package holding six one-gallon baskets; other grades are packed in the four-basket crate—a package holding four one-gallon baskets. Strictly fancy goods are so marked. Culls, where packed for shipment, should have the word "Culls" distinctly stamped on each end of the crates. Nothing has more to do with quick sales and good prices than honest packing, neat and trim crates clearly marked, each package indicating by its stamp just such goods as should be found within.

Very little fruit, other than that grown at the College, is shipped from this point. Not being able to ship, at times, in car lots, much of our goods has had to go by express, transportation charges being high. This, of course, materially reduces net proceeds. Most of our fruit has been sold in St. Louis, Chicago, and St. Paul.

The following figures show the approximate yield and returns from the six-acre commercial orchard after deducting cost of boxes, freights and commissions:

Year 1901, yield 550 bushels, net returns	$ 425 00
Year 1902, yield 520 bushels, net returns	540 00
Year 1904, yield 1575 bushels, net returns	1535 00
Total yield, 2645 bushels, net returns	$2500 00

As indicated under the heading "Cultivation and Cropping," the yield of sweet potatoes the first season was one hundred dollars for each acre in trees, or six hundred bushels. The yield in peas the next season was twenty bushels per acre, or one hundred and twenty bushels from the six acres. At fifty cents a bushel for potatoes and seventy-five cents a bushel for peas we have $390.00 for the two crops, or $65.00 for each acre. The cost of trees, the preparation of land and the planting of the six-acre orchard amounted to $66.75. As much of the work of cultivating, pruning, harvesting, and otherwise caring for the orchard was done by students, it was difficult to determine accurately the labor item. Fifteen dollars an acre per annum for the first three years, and thirty dollars an acre per annum since the orchard came into bearing four years ago, is a liberal estimate for all expenses incurred. At these figures the orchard account at the end of the third year was as follows:

Credits on peas and potatoes		$390 00
Cost of trees, preparing land and planting	$ 66 75	
Care of orchard	270 00	336 75
Balance to the credit of the orchard		$ 53 25

Fifty-three dollars represents a good rental value on the land for three years; at the end of which time we had an orchard ready for fruit-bearing and free from encumbrances.

Dividing the total net proceeds, $2500.00 for the three crop years, by three we have an average of $833.33 for the orchard, or $138.88 per acre for each fruit year. Dividing $2500.00 by four we have $625.00 as an average for the orchard during the four years, or $104.16 per annum for each acre. Now, from $104.16 deduct $30.00, the annual expense for caring for each acre, and we have $74.16 as a clear gain on each acre for each season during the past four years.

VARIETY ORCHARD.

As already indicated, the three-acre section occupying the more elevated portion of the orchard is devoted to variety work with peaches and plums. Two to three trees of each variety were planted. Some-

thing more than one hundred varieties of peaches and twenty-five of plums are in the tested list. Below is given a descriptive list of varieties which, from their behavior here, are worthy of place in Mississippi orchards.

Admiral Dewey.—Tree rather low and spreading. Dense, green foliage. Large, showy blossoms. Fruit of medium size; creamy yellow, with red cheek. Flesh yellow and of fair quality; almost free. Ripe June 15. A good bearer. Some rot during showery weather. A promising variety for early market and for home use.

Alexander.—A healthy, spreading, symmetrical tree. Fruit medium to large and globular. Peel greenish white with bright red cheek. Flesh greenish white, ripening unevenly and clinging to the stone. Rots badly during wet weather. A heavy and a regular bearer. Where trees stand apart or where so pruned as to admit a free circulation of air and sunshine, fruit is more showy and of better quality. Ripe June 10th. Possibly the best variety in its class.

Amelia.—A low, spreading, symmetrical tree. Fruit large, oval pointed at apex; color, lemon with red blush. Flesh yellowish white firm, juicy and good. Ripe July 12. Desirable for home orchard.

Champion.—A good, healthy, vigorous, spreading tree. Fruit medium to large; creamy white with red blush. Flesh white, pink at stone; quality excellent. Stone free. Free from rot, and a regular and heavy bearer. Ripe July 12. Valuable for home use and for local market.

Chinese Cling.—A well known old sort. Low, spreading head with deep green foliage and large leaves. Fruit large to very large, oval, creamy white splotched with red. Flesh white, very juicy and highly flavored. A shy bearer and rots badlly, especially during showery weather. Of value only for home use and for local market. Ripe July 20.

Crawford's Early.—Tree tall with spreading and rather slender branches. Fruit medium to large; yellow with beautiful red cheek. Flesh yellow, firm, juicy and flavor par excellent. A good shipper and very desirable for market and for home use. Ripe July 10.

Crawford's Late.—Tree resembles that of Crawford's Early possibly more symmetrical and of greater vigor. Fruit large. Color bright yellow with red cheek. Flesh similar to that of Crawford's

Early. A freestone. No rot. A rather shy bearer. A good shipper. Ripe July 20.

Elberta.—Low, spreading, open heads; an exceptionally uniform and symmetrical grower. Fruit medium to large, oblong and slightly flattened. Stone free. Color golden yellow with red cheek. Flesh yellow, red at the stone. Many peaches in the list better to eat; but little rot. A valuable shipping and market variety, standing in a class to itself. In its season it is the greatest of market varieties. A very heavy bearer; sometimes killed by cold when other varieties blooming at the same time escape. Ripe July 20th.

Family Favorite.—Tree spreading, an open head with well proportioned branches. Vigorous and healthy grower. Fruit medium to large, greenish white, washed with carmine; flesh firm, melting, sub-acid. A good variety for home use and for local market. No rot. Stone almost free. Ripe July 5.

Gen. Lee.—Low, spreading, open heads; a vigorous and healthy grower. Fruit medium to large; size much improved by judicious pruning and thinning. Color creamy white washed with light red. A seedling of Chinese Cling resembling its parent somewhat in both tree and fruit; much better in many respects. Little or no rot, a regular and heavy bearer. Decidedly the best clingstone in its season. Ripe July 25th.

Globe.—A vigorous, healthy, symmetrical grower. Fruit large, nearly round; rich golden color with red cheek; flesh yellow, juicy, melting, rich and exquisitely flavored. Freestone and a good shipper. Some rot. A rather shy bearer. Ripe August 1st.

Greensboro.—Spreading, open well disposed heads. A remarkably healthy and uniform grower. Fruit medium to large, oblong and slightly flattened. Ripens with Alexander; creamy white with bright red cheek, a beautiful peach. Flesh white, juicy and of fair quality. Decidedly the most showy peach of its season. A very heavy and a sure bearer. Much improved in size by thinning. Almost freestone. A fair shipper. Invaluable for local market and for home orchard.

Heath Cling.—Tall, upright, grower. Fruit medium size, white, sometimes washed with pale red. Flesh white, firm, vinous, good. Excellent for canning. A regular bearer. A home variety. Ripe August 25th.

Japan Blood.—A low, dwarfish, spreading, compact head; a vigorous and healthy grower. Medium size fruit, somewhat flattened and pointed at apex. Greenish white peel washed with red. Flesh deep red resembling that of Indian Blood; juicy, very acid until fully ripe, when flavor is fairly good. No rot; a heavy bearer; much improved by pruning and thinning. Ripe June 5th. Should be in every home orchard.

Mamie Ross.—A symmetrical, uniform, vigorous grower. Fruit large to very large; beautiful creamy white with red cheek; a beautiful peach when fruit has free access to air and sunshine. Flesh white, red at stone; a half cling; flavor only fair; too tender for distant shipping; attractive for home market; a little inclined to rot; ripe June 25th.

Orange Cling.—Tall, well rounded, open heads; a good healthy grower. Fruit large, almost round, beautiful golden color with bright red blush. Flesh yellow, juicy, rich, excellent. Fine for canning and preserving. Should be in every home orchard. No rot. Ripe August 5.

Old Mixon Free.—Tall, spreading, well rounded, open heads; vigorous and, in every way, a perfect tree. Fruit medium in size, globular; white with red cheek; flesh white, red at stone, sub-acid, flavor good. Freestone; no rot, a productive and a regular bearer. Too small for market but excellent for home use. Ripe July 20.

Stump the World.—A very satisfactory tree in most respects. Fruit medium to large, white with red blush; flesh white, juicy, highly flavored; productive; little or no rot; freestone; a fairly good shipper; ripe July 25.

Triumph.—An upright, tall tree with long, slender branches; vigorous and healthy. Fruit medium size, dull yellow washed with red. Flesh yellow, juicy and of fairly good flavor. A half cling. Some rot during wet seasons, a remarkably heavy and regular bearer. In the hands of the intelligent orchardist who will keep the tree severely pruned and the fruit properly thinned the Triumph is perhaps the most valuable peach in its season. Ripe June 10.

Sneed.—Tree and habits of growth very similar to that of Chinese Cling. Remarkably vigorous and healthy. Fruit large, creamy white with small red cheek. Flesh white, very juicy, but of poor quality. Its chief value lies in the fact that it is the first peach of the season. Until a better variety takes its place it will be much in demand

for local market and for home use. Very attractive and but little inclined to rot. A regular bearer and fairly productive. Ripe May 20.

Variety for variety's sake is of little value. Of several kinds ripening at the same time choose the best, one or two varieties at most, and discard the rest; and so for each ripening throughout the season. While the following list of tested varieties includes some kinds of more or less merit, the seven-year test here in the Station orchard indicates that the varieties above described should have first place. In the list which follows those marked (a) have decided merit; those marked (b) are less meritorious; those marked (c), fruit good or excellent in quality but trees not suited to this latitude; those marked (d), poor; those marked (f), not worthy of place in our list: (c), Angel; (b), Beauty Blush; (f), Bylen's Late; (f), Bustin's October; (d), Baldwin's Late; (b), Chair's Choice; (c), Chinese Honey; (a), Chinese Free; (a), Cobler's Indian; (b), Crosby; (d), Eaton's Golden; (a) Emma; (d), Everbearing; (b), Foster; (b), Hobson; (c), Honey; (d), Hughes I. X. L.; (a), Husted's Early; (f), Imperial; (b), Jesse Kerr; (b), Lady Ingold; (a), Lemon Cling; (b) Lemon Free; (a), Mt. Rose; (b), Mrs. Brett; (b), Muir; (f), Nix Late; (c), Onderdonk; (c), Pallas; (f), Peen To; (d), Rivers; (d), Sallie Worrel; (b), Schley; (b), Salway; (d), Steadly; (c), Stinson's October; (b) Tillotson; (f), Snow Cling; (b), Thurber; (d), Troth's Early; (c), Victoria; (f), Waldo; (a), Wheatly; (b), Wilkins, or Ringold Cling; (f), William's Cling; (f), Wonderful.

The orchard contains over fifty varieties not yet sufficiently tested to report.

PLUMS.

Abundance.—A spreading, well rounded, open head. A vigorous and healthy grower. Fruit medium to large, yellow skin washed with purplish red. Flesh yellow, firm, juicy, of best quality; adheres to seed; an excellent shipper. As its name indicates, it is an abundant and regular bearer. Must be severely pruned and carefully thinned if best results are desired. Some rot. Ripe June 20.

Burbank.—A low, spreading, well rounded, compact, vigorous grower. Fruit nearly round, yellow washed with cherry red; flesh, deep yellow, firm, juicy, good when ripe. An excellent shipper and one of the best market kinds. Like Abundance it is apt to make too much wood and to set too much fruit. Pruning and thinning is the

remedy. Rots considerably during wet weather. A clingstone. Ripe July 5.

Milton.—Low, spreading, compact, well rounded head. Remarkably symmetrical, vigorous and healthy. Quite an ornamental tree. A very regular and heavy bearer. Fruit small to medium; bright red changing to deeper shade as it matures; flesh yellow, very juicy, melting and of delicious flavor; too small and too delicate for distant market but par excellent for local market and for home use, especially for eating from the hand. No rot. If but one plum tree near the house I should plant Milton. Ripe June 10.

Ogon.—Tree a good, healthy grower, a regular and heavy bearer. Fruit a yellowish white; flesh yellow, firm and only fair in quality. A perfect freestone. Some rot. Not desirable for market; a good cooking sort. Ripe June 25.

Red June, or **Red Nagate.**—An upright grower with long slender branches. Fruit medium to large, pointed, purplish red peel covered with heavy bloom. Skin tough; flesh yellow, firm, clinging to seed. Juicy, sud-acid, only fair quality. Possibly the best shipping plum in the list. Prolific and very reliable. Ripe June 10.

Chabot.—Habits of tree similar to Red June. Fruit yellow washed with red, and of medium to large size. Flesh yellow, firm. Ripe July 10.

Wild Goose.—Quality good to best. Rots but little; a fairly good bearer. Tree inclined to blight and very soon after it reaches bearing age. Desirable for home use.

Test here during past seven years indicates that the following named varieties of plums are of little or no value: Chase, Fellensburg, German Prune, Gold Drop, Lombard, Pottawattanice, Prunus Pissardii, Prune Tragedy, Satsuma, or Blood, Shippers Pride, Semoni, Shropshires Damson, Washington Wayland, Willard.

Referring to page 1, paragraph on "Soil": Trees on the "stiff, heavy clay over a light colored sticky, poorly drained subsoil" have made a rather poor and unhealthy growth. Quite a large percentage of them have died. Fruit has lacked color and flavor. On the "deep, strong clay loam over an orange colored clay subsoil," the trees have grown rather too vigorously. In this section of the orchard it has been difficult to keep wood growth within proper limits. Much cutting

back and taking out interior branches so as to admit light and air has been necessary. Rather more fruit has set on these trees than in other parts of the orchard. On the "light grayish colored soil" the trees are of medium size, require but little pruning, produce a fair amount of fruit of good quality, but the trees show signs of "playing out." One or two years more will end their period of usefulness. On the "red clay over the deeper red subsoil," the trees are of medium size, but healthy, well shaped and require but little pruning. The fruit, on this section, is invariably more highly colored, freer from defects, more uniform in size and shape and more highly flavored than that from other parts of the orchard.

ABUNDANCE PLUMS.

Mississippi Agricultural Experiment Station.

BULLETIN NO. 94.

REPORT OF WORK AT

McNEILL BRANCH STATION FOR 1905.

By E. B. FERRIS.

I. OFFICE McNEILL EXPERIMENT STATION.

AGRICULTURAL COLLEGE, MISSISSIPPI, JANUARY, 1906.

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Report of Work at McNeill Branch Experiment Station for 1905.

By E. B. FERRIS.

Introduction.—During the year 1905 work at the McNeill Station was conducted on practically the same lines as have been reported in the three annual reports preceding this one and while several of our crops, especially some of the vegetables, did poorly, the most of them did remarkably well, and we feel very much encouraged on the whole over the future outlook for agriculture and horticulture in the Pine Belt of the state. Truck growing last spring was a partial failure over practically the entire South, weather conditions being such as to cause the crops over very wide areas to mature at the same time and consequently to be sold on glutted markets. In many portions of the South and particularly in our section, failures with certain fruits and vegetables might have been avoided by the judicious use of insecticides and fungicides. This was especially true with beans, tomatoes, and peaches. The majority of the general farm crops grown at the Station did well, perhaps such crops did better in the Pine Belt than they did in most other soil divisions of the state.

Seasons.—Several excessively heavy rains through the earlier months, culminating with an eight-inch rain on April 25th were the indirect causes of such entire failures as we have to report with several vegetable crops, while the effects of these heavy rains lowered the yields of many other crops considerably and made many of the tests with fertilizers unreliable. For several hours after the eight-inch rain had fallen, water covered a large part of the experimental plats and washed a lot of fertilizers, already in the ground, from one portion of the field to another. Several times during the year we found it advisable to cover the early vegetables with dirt to protect them from cold snaps of February and March, but owing to the loose nature of the soils of this section, this may nearly always be done without injury to the crops. As a rule, the rainfall for the entire year was bountiful, and, with the exception of the excessively heavy rains of April 25th, it was fairly well distributed. The minimum temperature and total rainfall for each month were as follows: January, 16 degrees, and 7.77 inches; February, 13 degrees, and 8.43 inches; March, 40 degrees, and 9.67 inches; April, 38 degrees, and 11.59 inches; May, 57 degrees, and

6.36 inches; June, 64 degrees, and 5.55 inches; July, 63 degrees, and 8.50 inches; August, 67 degrees, and 5.54 inches; September, 59 degrees, and 3.34 inches; October, 39 degrees, and 8.03 inches; November, 36 degrees, and 3.44 inches; December, 25 degrees, and 7.25 inches. The maximum temperature of the year was 98 degrees. The winds here are always excessive, and serve to dry the moisture out of the soils very quickly, making frequent and prompt cultivation an imperative necessity. The first killing frost did not occur until December 4th.

FRUITS AND VEGETABLES.

Strawberries.—The most of the work with varieties of strawberries has been discontinued, there being now only about 30, out of some 150 varieties originally put out. No very positive conclusions have been drawn as to the best varieties, but the Station uses the Klondyke, Excelsior, and Lady Thompson in its commercial patch. The Excelsior has the advantage of ripening very early, but is not so good as either of the others when sold at the same time. The Klondyke and Lady Thompson are about equally prolific, but the Klondyke colors better and is firmer. For nearby markets the Lady Thompson is as good as the best as results here go to prove.

The same plats of ground, used last year to determine the fertilizer requirements of this crop, were used again this year with results quite similar, for, while the yields were nearly 50% less than they had been the year before, they apparently lead to the same conclusions as to the relative benefits derived from nitrogen, potash and phosphoric acid. As stated in the last report, six different combinations of plant food, furnished by cottonseed meal, acid phosphate, and kainit were tried under Klondyke berries on one-twentieth acre plats, using a mixture of 200 lbs. cottonseed meal, 200 lbs. acid phosphate and 100 lbs. of kainit as a unit application, one-half being applied at the first cultivation after the picking season was over, and the other half at the last cultivation in the fall. Records were kept of the berries gathered between April 7th and May 10th, inclusive. When the three fertilizing materials were used in the proportions given above, berries were gathered at the rate of 2,620 quarts per acre; when 1,000 pounds of oyster shells were added to this mixture 3,100 quarts were obtained; when the cottonseed meal and kainit were cut down one-half and the acid phosphate remained the same, 2,380 quarts; with cottonseed meal and kainit normal and the acid phosphate doubled the yield was 2,980 quarts; when the cottonseed meal and acid phosphate remained normal and the kainit was left out entirely the yield was 2,240 quarts; and

when the cottonseed meal and kainit remained normal and the acid phosphate was left out entirely the yield was 1,840 quarts. At a glance one would be impressed with the marked effect of phosphoric acid as a food for the strawberry and this same relative power to increase yields may be seen with practically every crop.

Marketing berries.—During the earlier part of the shipping season the quality of the berries gathered was far superior to the berries of the year before and we realized much better prices for those sold. After the hard rain of April 25th, the quality of the fruit became very poor, the yields were considerably reduced, and very little in the way of net returns were realized from them. The most of these berries were marketed in the towns along the N. O. & N. E. R. R., though several shipments were made to Birmingham, Chattanooga, Cincinnati, and St. Louis to much better advantage than had been done the year before, due not alone to the better quality of the berries themselves, but also in large part to better shipping facilities—an additional train having been put on this road for the especial benefit of the truck growers who ship by express.

From a little less than two acres, 165 24-quart cases were sold which brought shippers net returns of $360.00.

I will again call attention to the superior merits of the ventilated crate. The greatest difficulty in handling a berry crop here has been in getting labor to pick them; this was not so serious in 1905 as it had been previously and we do not anticipate any trouble in having them gathered this year even though the acreage has been considerably increased. During the past year every effort has been made to get laborers with large families so as to have the women and children do such work, and we now have available for this purpose some fourteen or fifteen women and children as members of the families of the seven negro men whom we employ regularly. For two years past the strawberry has been by long odds the most profitable truck crop grown on the station.

Peaches.—The orchard of 98 Elberta peach trees on which we have been conducting tests with fertilizers since 1903, bore this year for the first time. The yield was fairly good considering the age of the trees, but the quality of the fruit was very poor, there being scarcely an absolutely perfect peach in the orchard. This was due largely to attacks by insects, as no effort was made to spray the trees at all, and nearly every specimen showed the effects of an insect. Frequent notes were taken during the spring to record anything of importance going to show the effects of the several kinds of fertilizers on the growth

and fruiting of the trees. The plats on which this work was done were each one-twentieth of an acre in size and, except in two instances, they contained five trees to the plat. While the most of the fruit was more or less faulty, very little was actually lost entirely. These peaches were marketed between July 3rd and 13th, but owing to irregularities in the soil (presumably) the results were not all considered reliable, and we only report the results from those plats where the yields were influenced by the fertilizers and not by differences in the soil itself. For instance, there were seven plats in a portion of the field where, before the land was cleared in 1902, a net work of old roads had run; in every instance the yields on these plats, regardless of the way they had been fertilized, were from 50 to 75% lower than on plats in other portions of the orchard.

In the results following we report the fertilizers applied and the yield of peaches, both in pounds per acre; no fertilizer, 1,330; 200 C. S. M., 3,850; 200 A. P., 1,900; 200 kainit, 2,420; 82 C. S. M., 82 A. P., 34 kainit, 4,680; 82 C. S. M., 82 A. P., 35 kainit, 1,000 oyster shells, 3,700; 180 C. S. M., 164 A. P., 68 K., 4,720; 82 C. S. M., 82 A. P., 88 K., 3,500; 90 C. S. M., 182 A. P., 34 K., 4,280; 90 C. S. M., 232 A. P., 3,560; 200 ground bone, 3,460; 100 A. P., 46 K., 2,060; 180 C. S. M., 62 A. P., 22 K., 4,760. Unlike the results obtained with other crops here, these would seem to indicate the prepondering influence of nitrogen rather than phosphoric acid; they also seem to indicate some benefits from potash, which has not been the case with other crops. We were never able to detect any difference in the color of the peaches due to the presence or absence of potash salts under the trees.

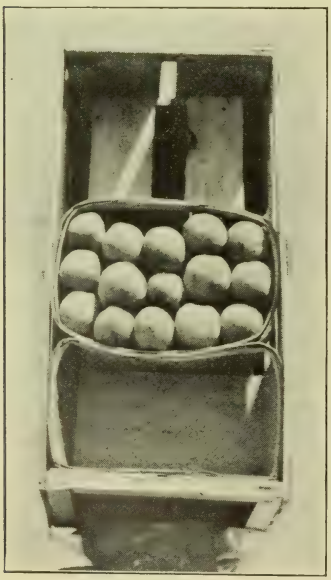

FIGURE II.

Marketing peaches.—In addition to the 98 Elberta trees, the station had about 95 Greensboro trees and some sixty trees of thirty other varieties to ship from. Of course the thirty varieties ripened at all seasons and, there being only two trees of a kind, we either did not sell the fruit at all or else sold it to no advantage so far as net returns were concerned. Our records show that there were sold

from the Greensboro orchard, together with such other varieties as ripened at the same time (possibly 20 trees) 105 crates of peaches which gave shippers net returns of $110.00.

From the 98 Elberta trees 60 crates were sold for a shippers net return of $67.50 and, not being able to sell the rest to advantage, they were canned on a small outfit bought for the purpose, making 35 dozen three-pound cans, the last being disposed of at from $1.80 to $2.00 per dozen. The most of the fresh fruit was sold along the New Orleans and Northeastern and Mobile and Ohio Railroads. The six-basket ventilated peach crate is the most desirable package in which to ship this fruit; they hold between one-half and three-fourths of a bushel.

During the present winter 1,000 additional Elberta trees were put out on land cleared during the year 1905, the idea being to have enough trees of one variety to ship the fruit in car lots. The San José scale was detected in the old orchard during the present winter and strenuous efforts are being made either to destroy it in its incipiency or to reduce its injurious effects to a minimum. While this scale is perhaps the most serious pest known to the orchardist, we do not feel discouraged because of its presence here. An orchard near Nicholson, Mississippi, twelve miles below McNeill, has had this scale for several years, yet these same trees produced some of the finest fruit that was sold last year on the New Orleans market, for in spraying to keep down the scale the owner also kept down certain insect pests and fungous diseases that made other peaches in this section so very faulty.

Other fruit trees.—None of the plums, pears, nor apples have as yet borne any fruit worth mentioning. Such of the apple trees as set any fruit at all carried it to a healty maturity, but a lot of fruit on the plum trees was ruined by insects and scarcely any of it ever reached maturity. Five hundred Red June plum trees were set out during the present winter, which, with one hundred trees of the same variety set out during the winter of 1904 and a number of trees in the variety orchard, gives the Station now a total of about 625 plum trees.

Remarks.—Experience here leads to the conclusion that it is almost folly to attempt to grow orchard crops without exercising every care possible to combat insect pests and fungous diseases. Though the Station examines its peach and plum trees as often as three times a year to destroy the borers, we frequently find as many as five of these borers in a single tree when we do examine them. The plum curculio will scarcely ever leave a young plum unmolested, and the San José scale will likely always have to be reckoned with. Every year fruit

tree agents sell hundreds of dollars worth of fruit trees through our immediate neighborhood, yet you scarcely ever see really first-class fruit on the small homesteads. As a business proposition I think it would be wise when beginning orchard work here to provide a suitable outfit for spraying all trees and to make a close study of the insects and fungous diseases that will sooner or later make themselves known. A good barrel spray pump with the necessary attachments, together with a stock of insecticides and fungicides, would likely pay the highest interest on the investment of any thing on the farm, for it will be found later that these things are as essential to growing good vegetables as they are in growing good fruits.

Asparagus (fertilizer test.)—Six plats of one-sixteenth acre each, on land of best quality and of uniform composition, were used to test the fertilizer requirements of asparagus. The crowns were put out in the spring of 1904 and were then fertilized just as they have been every year since, except that we have discontinued the use of cotton seed and have substituted other nitrogenous fertilizers instead. A mixture of 250 lbs. of cottonseed meal, 500 lbs. cotton seed, 405 lbs. acid phosphate, and 170 lbs. of kainit was taken as a unit application and gave a calculated yield of 1,168 lbs. of marketable asparagus during the spring of 1905; when the nitrogen and potash remained the same and the acid phosphate was cut down one-half the yield was 892 lbs.; when the ingredients furnishing nitrogen and potash were reduced one-half and the phosphoric acid remained normal the yield was 932 lbs.; when the cottonseed meal, cotton seed, and acid phosphate were normal and the kainit was left out entirely 892 lbs. of asparagus; when all the ingredients were doubled the yield was 960 lbs.; when no fertilizer at all was applied 752 lbs. of the marketable shoots were obtained. The residual effect of the fertilizers used on this land the year before evidently materially increased the yield of the blank plat, as we would never expect otherwise to see such a slight difference between fertilized and unfertilized land.

About one-half acre of land, in addition to the six test plats was devoted to asparagus, a portion of which had been planted in 1902 and the balance in 1903. None of this asparagus did as well in 1905 as we once had reason to expect it would do, though, as a matter of fact, none of it was quite old enough to cut from very heavily. We began cutting and shipping from all asparagus on March 22nd, and discontinued on May 2nd. Between these two dates 43 cases of 20 bunches each were sold and brought shippers net returns of $58.00. This asparagus was all shipped in very small lots and the express rate was much higher than if it could have been shipped in lots of 100 lbs. even.

This crop for the past two years, and especially during the last season, has suffered from a kind of rust or blight of the foliage which evidently had a marked effect in weaking the crowns. This trouble seemed to have mitigated considerably towards the latter part of the last growing season.

Beans.—The same tests with fertilizers under beans that have been conducted for three years past were repeated this year, the number of separate tests being somewhat increased. These beans never seemed to get over the 8-inch rain of April 25th; they rusted badly, and developed into a very unsatisfactory crop in every respect. The wax beans, which were planted over the greater part of the commercial patch developed a rust of the leaves and pods which not only reduced the yield in bushels, but made the crop unmarketable and we realized practically nothing from them. These beans were planted on March 18th, picking was begun on May 8th, and finished on June 5th, though, as a matter of fact, we did not attempt to ship the last pickings because they were being sold at an actual loss. The table below gives results somewhat in detail, plats 1 to 10 inclusive being on the unparked land, while plats 11 and 12 were on land on which the cattle had been fed during the winter of 1902 and 1903:

RESULTS WITH FERTILIZERS UNDER BEANS (1905).

Number of Plat.	Cottonseed Meal lbs. per acre.	Nitrate of Soda, lbs. per acre.	Acid Phosphate, lbs. per Acre.	Kainit, lbs. per Acre.	VARIETY OF BEAN.	Pounds per Plat.	Pounds per Acre.
1					Valentine	39	780
2	224	112	458	202	Kidney Wax	80	1,600
					Valentine	73	1,460
3	112	56	229	101	Kidney Wax	71	1,420
					Valentine	108	2,160
4	56	28	115	51	Kidney Wax	61	1,220
					Valentine	83	1,660
5	224	112	458		Kidney Wax	83	1,660
					Valentine	120	2,400
6	112	56	229		Kidney Wax	98	1,960
					Valentine	109	2,180
7			506	234	Kidney Wax	69	1,380
8	224	112			Valentine	87	1,740
9			506		Valentine	80	1,600
10				234	Valentine	48	960
11					Valentine	49	980
12	224	112	458	202	Valentine	105	2,100

Cabbage.—Both fertilizer and variety tests were conducted with cabbage and at one time the outlook for a good crop was very promising. However, the cabbage root maggot attacked the entire crop, including a commercial patch of one acre, when they were about half grown and the greater portion of them wilted without forming a head at all. No records were kept of the yields from the several test plats for they would have been worthless. The same trouble caused a most promising crop of cauliflower to make a total failure. This same wilting of cabbage seemed to have been prevalent over this entire section of the state. Quite a nice lot of cabbage plants were put out in the fall and for the first time in three years we succeeded in keeping them from being cut down by the cut worms as fast as they were put into

the field. These fall cabbage have grown nicely and practically all of them will form good heads, in fact, they are proving very profitable by being sold entirely on the local market.

Beets.—Beets have been found a very reliable crop here, especially when brought on the market early, a thing apparently easy of accomplishment, for they seem to stand any of our winter weather, as evidenced by a lot that were planted here during the past fall and which are now quite promising as an extra early spring vegetable. As a rule the beets that have been planted here in early spring have been brought to maturity early enough to sell at very remunerative prices. The "Egyptian Blood Turnip" is the variety from which we have gotten our best results.

Cucumbers and squash.—The Station has grown a few cucumbers every year, but has never marketed them successfully. In order to grow a nicely shaped and colored cucumber, it is necessary to keep them off the ground and on a trellis of some kind, still in the ordinary run of events the best of fruit grown here, outside of a green house, comes on the market too late to bring a good price. The same may be said of squash which we have grown in paying quantities, but which would not pay express to a Northern market. The Station's crop of cucumbers in 1905 was unusually good, but was sold for practically nothing.

Cantaloupes.—The Station made a remarkably good crop of cantaloupes last season on a small plat of land previously brought up to a good state of tilth by the use of animal manures. The quality of these melons was very good indeed, but they netted very little because they weighed so heavily and had to be shipped entirely by express. Heretofore this crop had not been grown here successfully, and at best it would only be sold profitably when grown in sufficient quantities to warrant carload shipments.

Egg plants.—Like cucumbers and squash, egg plants may be grown here to great perfection, but in the ordinary method of growing them in the open field, they mature so late that they are not worth shipping, at least by express. For several years the station has grown this crop in a small way, but it has never paid a cent and has been dropped from the list.

Onions.—Good onions have been grown here during the past year both from seed and from sets. Where the land can be made rich enough, onion seed planted directly in the field, or in a cold frame

and the young plants transferred when the size of an ordinary lead pencil, will do nicely here and prove a very profitable crop. The station has a beautiful lot of them growing now that were started some by one method and some by the other. The onion has so far had very few insect pests or fungous diseases to attack it, a thing well worth considering. Planting the sets in the spring is usually very costly, besides it has been our experience that they do not make the marketable onion so quickly nor of such uniform shape as those grown directly from the seed.

Turnips, rutabagas, and kohlrabi.—The Station has made crops of this character very profitable by growing them both in spring and fall. The turnips are sold entirely to the local sawmill trade; but when grown and placed on the market during the winter and early spring, there is a big demand for rutabagas in all the small towns over this entire portion of the state to say the least. The kohlrabi grows nicely here and when once the people become familiar with it as a vegetable, there will be as much demand for it as for early cabbage, a crop it approaches so closely.

Irish potatoes (fertilizer test).—Six plats each, on both parked and unparked land, were fertilized in duplicate and planted to Irish potatoes on February 1st, using about ten bushels of Tennessee grown Red Triumph seed per acre. All these potatoes came up nicely and were dug on the 23rd of May. There was very little difference between the yields on the parked and unparked land and in giving the yields from the several combinations of fertilizers, we have averaged the results instead of reporting each one separately. A mixture containing 214 lbs. cottonseed meal, 100 lbs. nitrate of soda, 456 lbs. acid phosphate, and 224 lbs. kainit was taken as a unit application for an acre, and the average of such an application on parked and unparked land was 103 bushels per acre; when the nitrogen and potash in this mixture were reduced one-half and the phosphoric acid remained the same the yield was 94 bushels; when the entire unit application was reduced one-half, the yield was 83 bushels; when the cottonseed meal, nitrate of soda, and acid phosphate remained normal and the kainit was left out entirely, the yield was 94 bushels; the average of the two blank plats was 43 bushels per acre; an application of 107 lbs. cottonseed meal, 50 lbs. nitrate of soda, and 228 lbs. of acid phosphate gave 92 bushels per acre.

In the last report we expressed the opinion that certain home-grown Irish potato seed, that has been used here to plant our commercial patches, had deteriorated and apparently had reduced the yields a

great deal. During the past season two plats of ground were treated exactly alike and one of them planted with seed grown in Tennessee and the other with these home-grown seed from this original stock. The result was that the northern grown seed gave a yield of 101 bushels per acre and the home grown seed yielded 70 bushels.

Irish potatoes (Variety test).—On March 3rd five plats of land containing one-twelfth of an acre each were fertilized at the rate of 1,200 lbs. per acre of a mixture of 300 lbs. acid phosphate, 200 lbs. cottonseed meal, and 100 lbs. nitrate of soda. These potatoes did not come up to a perfect stand and the per cent. of a perfect stand was determined by actually counting the hills in each plat. Early Rose with 70% of a perfect stand gave 51 bushels per acre; Hebron 80% of a perfect stand gave 83.6 bushels; Peerless with 90% of a perfect stand gave 93 bushles per acre; Rural New Yorker with 75% of a stand yielded 82 bushels per acre; Burbank with only 60% of a stand gave 99 bushels per acre and for the second time headed the list. These yields were considerably lower than were obtained from the same varieties the year before.

The experiment begun last year to determine the best size seed piece for planting was continued this year with results quite similar. The work was done on one-twentieth acre plats which had been fertilized at the rate of 1,000 lbs. per acre of a fertilizer analyzing 3% each of nitrogen and potash and 7% of phosphoric acid. This resulted as follows: one eye pieces yielded 97 bushels and required 350 lbs. of seed to plant an acre; two eye pieces, or quarters, gave 100 bushels and required 500 lbs. of seed; potatoes cut in halves yielded 137 bushels and required 860 lbs. of seed per acre; whole potatoes, the size of hen eggs, gave 140 bushels and it took 1,560 lbs. of seed to the acre. The seed used were grown in Tennessee. The seed that were cut sprouted at least one week earlier than the whole potatoes.

About two acres of land in addition to the test plats were planted to Irish potatoes and yielded about 75 bushels per acre. Some of these were sold on the Northern markets and gave returns of about 40 cents per bushel after commissions and freights were deducted, but conditions were such that it did not pay to ship after a certain time, so that fully half the crop had to be stored at home and sold later on local markets. A great many of these stored potatoes rotted though they were spread out, when dug, under a large shed on the north side of the barn and covered with sand. Such of these as did not rot were sold for about 75 cents per bushel.

A test was made of the "Look Out Mountain" potato, two bushels of them being planted in September. These potatoes came up to a fair stand, but at no time did they show the least indication of ever making any thing. We have tried fall Irish potatoes every year since 1902, but have never made much more than the seed planted.

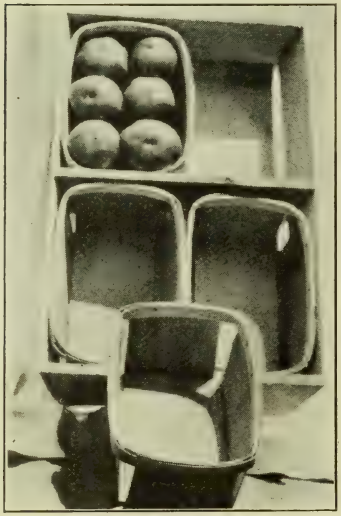

FIGURE III.

Tomatoes.—Tomatoes have been grown here every year since 1903, but never successfully from a commercial standpoint because the first and highest priced tomatoes always rotted. In 1905 these tomatoes were sprayed once with "Bordeaux Mixture" and it effected a wonderful improvement. It seems evident that if they had been sprayed earlier and oftener there would have been scarcely any rotten ones at all. A number of crates of first class tomatoes were sold from this small patch and a great many others were canned and disposed of in this way. The tomato ought to be a very profitable crop for these soils, if they could be grown of first quality, for unlike many other vegetables, an excessively rich soil is not so essential to success in growing them. The four basket crate is a very desirable package in which to ship tomatoes. The Station bought a small canning outfit in the spring, and at very little expense either in the original cost of the machinery or in the labor required in putting up the fruit, made use of all peaches and tomatoes that were partially faulty or that came too late to be shipped at a profit. All such canned goods may be sold locally at the highest market prices. The station will plant another year a considerably increased acreage in tomatoes, feeling convinced that with two or more applications of "Bordeaux Mixture" this rotting at the blossom end of the tomato may be effectually controlled.

STAPLE CROPS.

Sixty plats of one-twentieth acre each have been set aside for tests with fertilizers under corn and cotton and these same plats have been used in practically the same way both in 1904 and 1905, the idea being to make an exhaustive study of the influence of nitrogen, potash,

and phosphoric acid on crop yields. To the eye the land on which these plats are located seems remarkably uniform, yet there is a wide difference between the natural productiveness of the several plats, not only in this particular portion of the field, but in fact all over the forty acres devoted to plat work. This is true to such an extent that hereafter we shall not attempt to distinguish between the minor shades of differences in fertilizers, but will greatly decrease the number of combinations in which they are used and conduct the most important of these combinations in duplicate and triplicate, so arranging the plats as to overcome, as near as possible, the variations in yields due to differences in the soil itself. In conducting tests with varieties, we no longer plant each different variety in large plats to themselves, but distribute them, row by row, so as to do away with the effects of variations in the productive capacity of the soil to as large an extent as possible. By applying this same principle to our fertilizer work, having the plat instead of the row as a unit, it is hoped to make the results more reliable than at present.

Corn (fertilizer test).—Thirty plats of land were used for this work, each plat being 15 by 145 feet, and containing one-twentieth of an acre. These plats were divided into four rows, each 3.75 feet apart, and the corn was dropped in faint checks three feet apart, giving exactly the same number of hills per row. The fertilizers were applied in drill on March the twelfth, and the corn planted immediately by hand, dropping several grains in each hill. A remarkably uniform stand was gotten and maintained and the crop was carefully and frequently cultivated through its entire growing season. No attempt was made to save the stalks for forage, as the weather, at the time this corn was ready to cut, was, and always is, so damp and showery that it is practically impossible to cut and save corn stalks. The corn was gathered on August 22nd when it had dried thoroughly on the stalks, and in calculating pounds per plat to bushels per acre, 70 pounds of nicely slip-shucked ears were taken as the equivalent of a bushel of shelled corn. In the table following, the results of this experiment are given in detail, the plats from one to thirty, inclusive, being on unparked land, while plats 31 and 32 were on the parked area:

RESULTS WITH FERTILIZERS UNDER CORN.

Number of Plat.	Cottonseed Meal, lbs. per Acre.	Acid Phosphate lbs. per Acre.	Kainit, lbs. per acre.		Slip-shucked Ears, lbs. per Acre.	Shelled Corn, Bushels per acre.
1					35	10
2	100				47	13.4
3	200				95	27.1
4				100 Nitrate of Soda	77	22.0
5				100 lbs. Dried Blood	59	16.3
6		100			105	30
7		200			100	28.6
8			100		53	15.1
9					46	13.1
10		44	28	100 lbs. Nitrate of Soda	90	25.7
11	45	42			93	26.6
12	135	126			96	27.4
13	90	184			117	33.4
14	90	234			127	36.3
15				165 lbs. Ground Bone	133	38.0
16	90			414 lbs. Lime and Acid Phosphate Mixture	116	33.1
17	135		50		88	25.1
18	180	62			107	30.6
19	225	52			107	30.6
20	100			200 lbs. Ground Phos. Rock	128	36.6
21			70	152 lbs. Ground Phos. Rock	97	27.7
22	45	42	17		98	28.0
23	135	22	52		101	28.9
24	135	72	52		102	29.1
25	135	126	52		122	34.9
26					60	17.1
27	90	132	34		109	31.1
28	45	142	17		106	30.3
29	100			200 lbs. Soft Phos. Rock	98	28.0
30	135	126	4		111	31.7
31				Parked Land	112	32.0
32	135	126	52	Parked Land	120	34.3

Remarks.—These results do not differ materially in what they teach from the ones that have been obtained here during three previous years. Phosphoric acid is the ingredient of any fertilizer, containing it, from which we may expect the most marked increase of crop, and for three years the water soluble form has apparently shown very little superiority over the insoluble and reverted forms of the same material. Experiments here, up to this time, would indicate that on the unimproved soils of this section the most economical fertilizer for corn is one containing 1 part cottonseed meal to 2 parts acid phosphate, applied at the rate of from 100 lbs. to 300 lbs. per acre. Of

course as the mechanical condition of these soils is improved the quantity of commercial fertilizers, which may be used economically, will be materially increased. The results of four years work with fertilizers under corn indicate a slight increase of crop from the application of potash salts, but we are of the opinion that even this very small increase of two or three bushels per acre is more apparent than real, for it is well within the limit due to unavoidable errors in conducting such tests.

Corn (variety test).—Twenty varieties of corn were grown on the most uniform piece of land on the station farm; each variety was planted in a single row and these rows were distributed over the patch so as to do away, as nearly as possible, with variations in yields due to inequalities in the productiveness of the soil itself. Only enough land was available for this work to give three rows to each variety, these rows being 3.75 feet wide by 300 feet long. All the seed corn except Mosby's Prolific and Early Breadfield were obtained from T. W. Wood and Sons, Richmond, Va., the Mosby came from the Mississippi A. & M. College and the Early Breadfield from Major M. F. Berry, Pachuta, Mississippi. This corn was fertilized at the rate of 300 lbs. per acre of a mixture of equal parts acid phosphate and cottonseed meal and the following yields, calculated in bushels per acre, were obtained: Mammoth Shoe Peg, 39.6; Blounts Prolific, 38.6; Virginia Ensilage, 34.8; Boone County Special, 33.1; Eureka, 36.3; Cockes Prolific, 44.6; Mosby's Prolific, 35.2; Holts Strawberry, 43.1; Hickory King, 32.6; Golden Beauty, 32.2; Virginia Yellow Dent, 33.5; Champion White Dent, 28.1; Reed's Dent, 33.1; Champion Yellow Dent, 25.5; Schwill's Improved Large Adams, 19.6; Improved Golden Dent, 35.7; Early Breadfield, 37.4; Improved Leaming, 28.0; Improved Southern White Snowflake, 33.6; White Majestic, 33.4. For the second time Cocke's Prolific has led all other varieties here and we regard it as a very valuable corn for this section.

Corn (tillage tests).—Four plats of land, each one-tenth of an acre in size, the same plats that have been used for a similar experiment since 1903, were used again this year to determine the effects of deep and shallow preparation and cultivation on the yield of corn. Two of these plats were subsoiled to a depth of 18 inches in the spring of 1903, while the other two were broken only 5 inches deep. Since the original subsoiling, all these plats have been prepared alike and to the same depth, it being assumed that the deep breaking given the subsoiled plats in 1903 would still be effective. This corn was fertilized at the rate of 300 lbs. per acre of a mixture of equal parts acid phos-

phate and cottonseed meal. One plat in each series was cultivated shallow and one deep, the deep cultivation having been discontinued in each instance when the corn was waist high, subsequent cultivations being the same as on the other plat and was done with a Perry cultivator. Deep preparation and deep cultivation gave 36.7 bushels per acre; deep preparation and shallow cultivation, 37.6 bushels; shallow preparation and deep cultivation, 35 bushels; and shallow preparation and shallow cultivation gave 36.4 bushels per acre. The shallow cultivation was done at a depth of about three inches and the deep cultivation at a depth of about 5 inches. These results seem to indicate conclusively that very deep plowing on these sandy soils is a useless expenditure of energy.

One of the best plats of land on the place, about one-half acre in size, was planted to Mosby Prolific corn after all other corn in the field was old enough not to mix with it by cross fertilization. This corn was watched closely throughout its growing season, and all the tassels from inferior stalks destroyed. When the corn was mature, the entire patch was gone over carefully and the ears from selected stalks chosen for planting another year, the idea being to select still further from the corn already chosen and finally to so improve the variety as to get a better yielder and a more desirable type of corn.

Cotton (fertilizer test).—Every test with fertilizers under corn was duplicated with cotton, but the soil on which these cotton plats were located was not so uniform as that with the corn; neither did we get a good stand of cotton and the two irregularities combined have served to make these tests with cotton practically worthless and for this reason they will not be reported.

Cotton (variety test.)—Thirteen varieties of cotton were planted on a piece of land of fairly uniform composition which had been well prepared and fertilized at the rate of 300 lbs. per acre of a mixture of two parts acid phosphate and one part cottonseed meal. As with the corn, each variety occupied a single row and these rows were distributed over the patch in such a way as to do away, to as great an extent as possible, with the effects of the inequalities of the soil. Each of these rows were 3.75 feet wide by 146 feet long and there were four rows to each variety. The yields, calculated in pounds per acre, were as follows: Kings, 820; Hagaman, 820; Texas Wood, 780; Strickland, 820; Culpepper, 890; Russell's Big Boll, 960; Cooks, 970; Texas Burr, 820; Lewis' Prize, 920; Willet's Red Leaf, 680; King No. 1, 900; King No. 2, 930; Long Staple from Major M. F. Berry, Pachuta, Miss., 780 lbs. per acre. The seed used in the tests were obtained as follows:

Culpepper, Hagaman, Strickland, and Texas Wood, from U. S. Department of Agriculture, Washington, D. C.; King No. 1 and King No. 2, from T. J. King, Richmond, Va.; King's Improved, grown on Station farm; Cook's Improved, J. R. Cook, Ellarville, Ga.; Willett's Red Leaf, N. L. Willett Seed Co., Augusta, Ga.; Lewis' Prize, W. B. F. Lewis, Lewiston, La.; Texas Bur, C. E. Smith, Locust Grove, Ga.; Russell's Big Boll, G. F. Park, Alexander City, Ala.

Cotton (tillage tests).—Work just reported as having been conducted with corn was duplicated with cotton with results as follows: deep preparation and deep cultivation, 960 lbs. per acre of seed cotton; deep preparation and shallow cultivation, 1,020 lbs.; shallow preparation and deep cultivation, 1,070 lbs.; shallow preparation and shallow cultivation, 980 lbs. of seed cotton per acre. They evidently lead to the conclusion that subsoiling these lands is not necessary at the present time.

An effort was made to determine the best width of row and the best distance apart in the drill for planting cotton and to this end twelve plats of land were set aside (the same that were used last year) and the width of the rows were varied from three to four feet and the distance apart in the drill from nine inches to three feet. This varied the theoretical number of stalks per acre from 3,630 to 19,360. The average of the four plats of four foot rows was 855 lbs. of seed cotton per acre; of the same number of three and one-half foot rows, 880 lbs. per acre; and of the four plats of three foot rows, 877 lbs. of seed cotton per acre. The average of three plats having the cotton 9 inches apart in the drill was 1,026 lbs. of seed cotton per acre; of three plats with the cotton one foot apart in drill, 914 lbs. of seed cotton per acre; of four plats two feet apart in the drill, 825 lbs.; and of the same number of plats with the cotton three feet apart in the drill 718 lbs. per acre. The actual number of stalks on the several plats closely approached the number calculated by figuring the width of the rows and the distance of plants in the drill.

FIGURE IV.

Oats.—Previous to this year the Station had not made a marked success at growing oats. This has been due largely to the fact that all the land was freshly cleared and lacked that degree of fertility necessary for growing this crop. In the fall of 1904 about one and one-half acres of land was thoroughly prepared and fertilized with manure gotten from the ox lots at nearby saw mills. These oats did remarkably well as shown by the accompanying illustration. They did not grow very tall, but were unusually heavily headed and a measured acre yielded 3,760 pounds of well cured oat hay. Several acres of oats have again been sown during the past fall, and wherever the ground has been enriched by leguminous crops or animal manures the oats are quite promising.

FIGURE V.

Hairy Vetch.—From an original patch of one-half acre, half of which was inoculated with soil from a vetch patch at the A. & M.

College, the Station has gotten soil for inoculating several additional acres of land for vetch. Mention was made in a previous report of the very marked effect this inoculation had had on the crop of the year before. As was expected, the inoculation spread over a considerable part of the uninoculated soil where the two came together, but the effects were still quite marked on the crop of the second year, which had come up as a volunteer crop from that of the year before. The illustration shows this vetch as it appeared last spring when it was between knee and waist high. During the past fall the upper two or three inches of soil from the entire inoculated portion of the original vetch patch was removed, and by means of a manure spreader was scattered thinly over about five acres of land which had been planted to vetch alone, to vetch and oats, and to vetch on bermuda sod. All the newly planted vetch came up beautifully and has grown off as nicely as could be desired. In fact, it appears as thrifty at this time as any vetch ever does at the A. & M. College, where it has been grown for a number of years. The vetch alone and in combination with the crops mentioned above has furnished good grazing for horses and hogs through the entire winter.

Other legumes.—Alfalfa was again planted here about the first of last October on land that had been planted in the spring to Irish potatoes and in the summer to cowpeas. Before planting the alfalfa seeds the land was put into as fine a state of preparation as any one could desire and the seed came up promptly to a perfect stand; but many of them died from an unknown cause and the land was gone over with a Hallock weeder, which prepared a shallow seed bed but did not destroy the living plants, and alfalfa seed were resown during the latter part of November and worked into the soil with the same implement. This second sowing again completed the stand, but a winter weed, resembling mullein, soon made its appearance in such quantities as to effectually choke out the alfalfa in certain places and to seriously retard its growth all over the patch. The land used for this experiment is the same that was used previously for this crop when the crab grass, during July and August of 1904, completely choked out the alfalfa. A similar experience exactly was had with crimson clover, which in the fall of 1903 and again in 1905, was planted alongside the alfalfa on land similarly prepared and fertilized. This clover did not come up at all in the fall of 1903, but did come up and do nothing in the spring. In 1905 it came up perfectly, died down partially, was again resown and a second stand obtained, and at present would apparently succeed but for the presence of the winter weed in such large quantities.

Cleaned bur clover seed were bought in Birmingham, Ala., and San Francisco, Cal., and were sown in considerable quantities during the past fall. These seed were exactly alike so far as appearances then indicated and so far as we are able to tell from the plants themselves, though there is a perceptible difference between this clover and that already growing here, the seed of which were obtained in the bur from parties in Starkville. These cleaned seeds germinated quickly and perfectly and the crop from them is quite promising.

FIGURE VI.

Sugar cane.—The experiment with fertilizers under sugar cane reported last year was continued with the stubble crop, but these sprouted so poorly that the results are not worth reporting. Ten similar tests were conducted with plant cane, all of which gave remarkably heavy yields; but owing to the fact that this portion of the field was partially overflowed, during the eight-inch rain, with washings from land that has been fertilized with stable manure, and also from the parked area, there was very little to be gotten in the way of information from the results and they will not be reported in detail. The unfertilized plat in this experiment made 30.6 tons of cane per acre, which was slightly more than some of the fertilized plats, though a yield of 39.2 tons per acre was obtained from one of these plats. This indicates at once that there was something wrong, for without

the addition of fertilizers in some way we could not have expected more than one-fourth of such yield of cane on these soils. The accompanying illustration shows one corner of this cane patch and was taken several weeks before the cane was cut.

Making sirup.—Including the test plats, the station had about three acres of cane to be made into sirup, besides one acre of stubble cane which was saved for seed. During the fall a sirup house was built and equipped at a cost of $3,000.00, in which all of this cane was manufactured into sirup. About 1,200 gallons was the output and the most of this was put up in one-gallon cans and is being sold in small quantities at the time, on nearby markets, at from 45 to 55 cents per gallon, according to the cost of the container in which it is sold. The cooking is done with steam and so far the sirup has shown no disposition either to sugar or sour, while a number of samples of sirup made on the evaporators around here have either crystalized or set up a fermentation when subjected to comparative tests along with it. In one test comparing the sirup made by this steam train process with one of the best grades of evaporator sirup made at Poplarville, we covered the bottoms of ordinary water glasses about one-half inch deep with the sirup and set them aside for two weeks, exposed to the atmosphere. In less than two days fully half of the evaporator sirup had gone to sugar and at the end of two weeks three-fourths of it was a solid lump, while the sirup made here, and by the Allen Brothers at Emerald, Miss., only showed the faintest crystals of sugar. The gravity of a number of samples of cold sirup had just been taken before this: that from Poplarville having registered 40 degrees; that made by the Experiment Station, 39.2 degrees; that made by Allen Brothers, 38.2 degrees; sirup made by a Mr. Lumpkins of McNeill (already half sugar), 38.2 degrees; and a fifth sample from Mr. W. D. Graham of McNeill, 38 degrees. There are great possibilities in this section of Mississippi for sugar cane if the sirup from it can be placed on the market in an attractive way with a reasonable assurance that it will neither sugar nor sour. The Station hopes with this new outfit to do work that will show just how such a thing may be accomplished and also to aid in developing a market for the sirup after it is manufactured. If a success is made with this steam plant, such an one might be supported in every country community, very much as are the cotton gins at present. If the farmers could be assured of 40 cents a gallon for their sirup, the growing of sugar cane would soon make the land of this section exceed the best Delta soils in value. At present there is much discouragement in this immediate territory over the inability to market an unusually large sirup crop at any reasonable price.

Cassava.—The Station lost its entire crop of cassava canes saved from the previous year's crop. These canes had been banked the fall before as carefully as possible and apparently should have kept better than through the winter before when they were preserved in perfect condition. At planting time last spring, the butt ends of these canes were still green and were cut off from the parts that were dead and planted, but very few of them sprouted. A lot of canes were ordered from Florida, but were so long on the road that half of them were dead when they were received and only a small percentage of the ones that showed life ever sprouted. Cassava is a heavy yielder on thin sandy soils, but the canes are so hard to keep through the winter, and other crops such as sweet potatoes approach it so closely in yields, that we do not feel justified in advising its growth, as yet, in any other than an experimental way.

Peanuts.—Both Spanish and Virginia peanuts were grown here last year and both yielded well. The Spanish peanuts were planted as late as June 24, and these produced about as well as those planted two months earlier, in fact, when planted late they mature at a season when there are fewer showers and when both vines and nuts may be saved to much better advantage. If planted early the vines and nuts mature in August when there is usually too much rain to cure either satisfactorily and when if left in the ground the nuts will all sprout and the vines decay. Tests were conducted to show the effects of different fertilizing materials under Spanish peanuts, but these were planted early and we could not save and weigh the vines on account of rain, and can only report the yield of nuts which were as follows, calculated in pounds per acre: no fertilizer, 1,472; 50 lbs. nitrate of soda, 200 lbs. acid phosphate, and 100 lbs. kainit, 1,760; 200 lbs. acid phosphate and 100 lbs. kainit, 1,792; 200 lbs. acid phosphate, 100 lbs. kainit, and 1,000 lbs. of air-slaked lime, 2,016; 200 lbs. acid phosphate, 1,760; 100 lbs. kainit, 1,680. A measured bushel of these nuts weighed 22 pounds.

One-fourth of an acre of land next to the above mentioned test plats was fertilized at the rate of 200 pounds of acid phosphate per acre and planted to the Virginia peanut bought from a lot that were being sold on the local market for eating purposes. They yielded at the rate of 1,792 pounds of dried nuts and 3,520 pounds of well cured hay per acre; a measured bushel of the nuts weighing 20 pounds. In addition to the above, the Station grew peanuts on about three acres of land and grazed them off with hogs, the intention being to determine their value for this purpose, but unfortunately disease got among the hogs at this time and the experimental feature of the work was aban-

doned, some of the hogs having died while others were rendered unthrifty by the attacks of the disease, which post mortem examinations showed to be some affection of the kidneys.

Cowpeas.—While a great many cowpeas were grown here during the year the tests conducted with them were confined to six experiments to determine fertilizer requirements and four to determine the most economical quantity of seed to use in planting the crop .Cowpeas were grown after practically all of our corn and after the most of the vegetables, and the hay saved from them has furnished all the roughage for six horses and mules and three mule colts from one end of the year to the other. As a rule these peas have borne very little fruit when planted early, but have fruited fairly well when planted during July. The six tests with fertilizers under cowpeas were an exact repetition of those with peanuts. They gave results as follows: no fertilizer, 1,136 lbs. of hay per acre; 50 lbs. nitrate of soda, 200 lbs. acid phosphate, and 100 lbs. kainit, 2,872 lbs. hay; 200 lbs. acid phosphate and 100 lbs. kainit, 2,640 lbs. hay per acre; 200 lbs. acid phosphate, 100 lbs. kainit, and 1,000 lbs. slaked lime, 2,816 lbs, of hay per acre; 200 lbs. acid phosphate, 2,416 lbs. hay per acre; and 100 lbs. kainit, 992 lbs. hay per acre. Taking unavoidable errors, due to variations in the soil, etc., into account, we would conclude from these results with peanuts and cowpeas that acid phosphate alone was the most economical material with which to fertilize them. This work with peanuts and cowpeas was done on one-sixteenth acre plats.

On April 15th, four plats of land, each 9 feet wide by 300 feet long were fertilized at the rate of 200 pounds of acid phosphate per acre and the quantity of seed used to plant them was varied in four different ways by using the three sizes of discs of Avery's Uncle Sam planter on three plats and by dropping the peas in hills by hand on the fourth plat. None of the peas made any seed and the vines were cut on July 26th, carefully cured, and the weights obtained when in condition to be placed in the barn. The rows were three feet apart and it required at the rate of 80 lbs. of peas per acre to plant them with the thickest drill, the yield of hay being 3,520 lbs. per acre; the next size drill sowed them at the rate of 40 lbs. per acre and the yield of field cured hay was 4,000 lbs. per acre; the plat with the fewest number of holes planted the seed at the rate of 20 lbs. per acre and the resultant yield in hay was at the rate of 3,200 lbs. per acre; the peas dropped by hand in hills 18 inches apart required at the rate of 16 lbs. of seed per acre and made at the rate of 4,000 lbs. of hay to each acre. The Station plants practically all of its peas in the drill because it requires fewer seed to

plant an acre and because it enables us to give them a few light cultivations to keep down their worst enemy, crab grass, until the peas can get a good start.

Bermuda grass.—The work begun in 1904 to sod a lot of broken land, used as a pasture, to bermuda grass, was continued through 1905 with very satisfactory results considering certain difficulties that were met with. The trees, logs, and undergrowth had been removed from at least eight acres of this land during the summer and winter before and in the spring of 1905 this land was broken very roughly, as a matter of course, and bermuda grass seed sown over it at the rate of about three pounds per acre. Before sowing the seed the land had been fertilized with a very light application of acid phosphate which was harrowed into the soil with a smoothing harrow. The seed were then mixed with cottonseed meal as a carrier and sown over the land, being then harrowed in as lightly as possible with the same smoothing harrow. Just after sowing these seeds the excessively heavy rain of April 25th came, and, as the land was very much broken, a great many of them were necessarily washed away and such as were left were not sufficient to make any thing like a stand. Every thing was gotten ready at one time to plant the whole lot over, but an occasional sprig of the grass encouraged us to let it stand. These scattered bunches of grass spread so rapidly through the summer and fall that by the time it was killed down by frost, it had sodded practically half of the land, and will cover it entirely by August of the coming summer.

Rape.—About three-fourths of an acre of rape was sown here in the fall on land of very moderate fertility; it came up to a good stand and made an abundance of green forage for hogs during the winter. This could evidently be made a most profitable crop for this section, and in connection with hairy vetch would easily furnish pasture for hogs through the entire winter. It is evidently much better adapted to the soils here than to those around Starkville where I have seen it fail oftener than it succeeded.

FIGURE VII.

Livestock. One of the brood mares belonging to the Station died during the past year and another mare has failed so far to breed, which leaves now only one animal from which to raise mule colts. This particular mare has raised a colt each year since we began breeding her and will soon drop the third colt. The jack that was gotten in exchange for the small one originally purchased has developed wonderfully and is now one of the finest animals of its kind in the state. Having been less than three years old during the past season, this jack was only bred to about a dozen mares, but it is hoped through the coming season to have him serve a greatly increased number. The three mule colts have done nicely and one of them would perhaps take the prize over any other mule colt in the state, at least experts have pronounced him as fine a colt as they had ever seen.

The Station was very unfortunate during the past year with its hogs. Quite a number of sows and pigs were bought in the early fall to eat up crops of Spanish peanuts, rape, and the pickings from several acres of sweet potatoes. Though care was taken to exclude all hogs where there seemed the least danger of getting contagious diseases, sickness finally appeared among them and killed several while many others were left in an unthrifty condition and never made a satisfactory growth. The disease that caused the trouble had few, if any, symptoms of cholera, the malady we feared most, but seemed to have been largely an affection of the kidneys.

Sweet potatoes. - The station had about four acres planted to sweet potatoes which made good yields, but unfortunately rotted badly before they were disposed of. The sweet potato crop was a very large one over this entire section, and when they were first dug there was only a limited market for them at any price, and in attempting to hold them for better prices a great many people lost a large percentage of the crop. This rotting was caused largely by portions of the potatoes near the surface of the ground having been frost bitten in the freeze of December the fourth. It is thought that potatoes keep better when dug after the vines have been killed by a light frost, and for this reason a great many people, the Station included, did not dig potatoes until

very late. The potatoes here having been cultivated on very shallow beds, were badly damaged when the thermometer went to 24 degrees for several nights in succession.

Ten plats of land were fertilized in as many ways and an effort made to determine the best kinds and combinations of plant food with which to fertilize the crop, but for some cause which we are unable to explain these fertilizers seemed to have very little influence on the yields; the blank plat made more than some others that were well fertilized and it would seem useless to attempt to draw any conclusions from the experiment. On all these plats the yields were very heavy.

Rotations.—The work with rotations is being continued and marked results were gotten during the past season when comparing cotton on land where the rotations of crops has taken place for the past three years, with a similar plat planted continuously to cotton for the same length of time. On the fertilized half of the rotation plat cotton made 904 pounds per acre in the seed, while on the plat planted continuously to cotton the yield, under similar treatment, was 724 pounds. The yields of cotton of the unfertilized portions of both plats were practically the same showing absolutely no benefits from rotations except when used in connection with fertilizers or manures. As a matter of fact, the cowpea is the crop from which the greatest good is gotten in these rotations and experience here for three years has shown that, except when fertilized, these peas do nothing except to sprout and remain at a standstill until they die or come to maturity. For this reason the original plan of the experiment has been so changed as to allow the peas to be fertilized with acid phosphate whenever they appear in the rotation.

FIGURE VIII.

Manure.—Every effort has been made to get animal manures with which to enrich certain lands here where vegetables are to be grown. A manure spreader was bought more than a year ago which greatly reduces the cost of handling these manures. For a time manure could be bought from the ox lots at local saw mills, but this is no longer possible as the owners of the oxen soon saw where it paid them better to use this manure on their own premises. Last winter an effort to get manure in New Orleans was repeated, with slightly better results than had attended previous attempts, and a number of tons were obtained from an abattoir and shipped out in car lots. This manure was sold at a nominal sum at the slaughter house, $1.00 per car; the loading cost from $5.00 to $6.00 according to the capacity of the car; and the freight and beltage charges were $12.50 per car regardless of the tonnage. By having this manure loaded in cars of maximum capacity 30 to 40 tons, it cost delivered here from 50 to 75 cents per ton. This manure had 73.4% of moisture in it and its contents of .4% nitrogen, .26% phosphoric acid, and .15% potash gave it a commercial value of about $1.60 per ton. The excessive amount of water was due to its having lain out in all weather, and made the handling of it of doubtful value and the attempt was discontinued after getting six car loads. This manure was made up of all the refuse from animals slaughtered there and contained a good deal of hair which will of course require several years before it becomes available for plants. The effects of this manure have not been very marked on the first year's crops. The illustration at the beginning of the paragraph shows the manure spreader loaded with manure and ready to distribute it.

Mississippi Agricultural Experiment Station.

BULLETIN No. 95.

THE DAIRY COW.

By J. S. MOORE.

TIMOLA

Owned by Mississippi Experiment Station.

AGRICULTURAL COLLEGE, MISSISSIPPI,
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THE DAIRY COW.

Mississippi is an agricultural State and the large proportion of her population will continue to be engaged in farming. Dairying is beginning to be recognized as a branch of this industry that will play no small part in the future development of the agricultural interest of the people. As its advantages and opportunities are understood and the principles underlying successful breeding and feeding are put into practice, we may expect to see a rapid growth in the dairy interest.

That there are many cows in the State today that are unprofitable is certain, and it is the object of this bulletin to give such information as will enable the farmer to keep only such cows on his farm as will, with proper care and management, prove profitable.

Breed.—It is not our purpose to discuss the merits of the different breeds of cattle in this bulletin; neither would we recommend that the average dairyman or farmer start with a herd of pure bred cattle. There are four principal dairy breeds that would, however, under proper environments give larger returns than our native or grade cattle. They are the Jersey, Guernsey, Holstein, and Ayrshire. The Jersey and the Guernsey are noted for the richness of their milk, and for butter production they have no superiors. Their calves are usually of the dairy type and not of much value for beef. The Holstein and the Ayrshire give larger quantities of milk than the above breeds, are larger animals, but their milk is much poorer in quality and they are, perhaps, better suited to conditions where the milk is sold as such for direct consumption and where large quantities of coarse hays and forage are available. Under some conditions the farmer might find it to his interest to get one of the dual purpose breeds of cattle; one that will give a fair quantity and quality of milk and that will also bring a calf that will make a good beef steer the cow herself being one that will fatten readily when no longer needed in the dairy. The Red Polls, Devons, and the milking strain of the Short horns are probably best suited for such purpose. A pure bred bull of the breed that we select should always be used. This should be done whether we use common, grade, or pure bred cows. We have often heard it said that the "bull is half the herd." If he is a good one, he is more

than half. This is especially true where we have cows of mixed breeding, as the bull will stamp his qualities on the offspring and they will be more like him than the dam. The bull should not only be a good individual and a pure bred animal, but his dam and grand-dams should be good individuals and large producers.

Selection.—The great majority of farmers must of necessity at least begin with grade cows and there are a large number of these well suited to our conditions. Only the best cows, however, should be selected and those that are now being kept at a loss should be disposed of. It is only by such a method as this that we can ever hope to have a first class dairy herd. Some of the more important indications of a dairy cow are as follows: The head and neck should be rather small and proportionately long. The eyes should be prominent, with a bright intelligent look. The body or barrel of the cow should be rather long and with good depth through the digestive system, showing a capacity for taking in and digesting large quantities of feed.

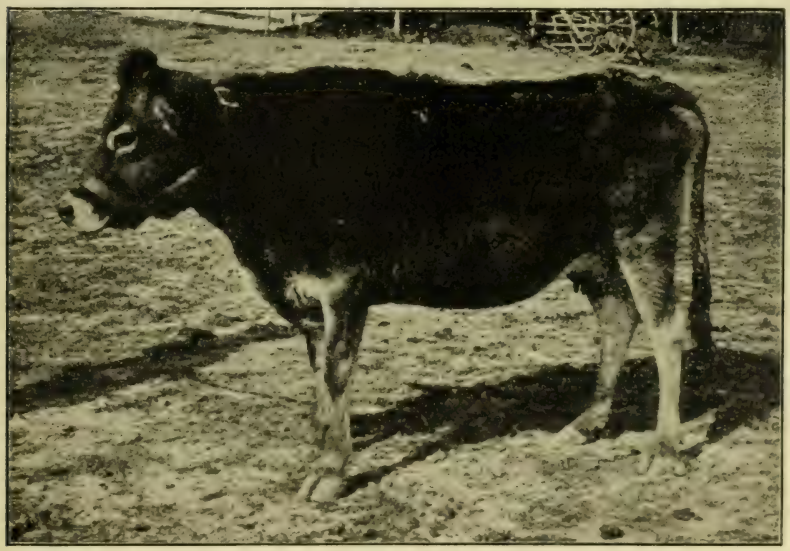
The forepart of the cow may be light, but the barrel should gradually deepen to the flank, joining the udder in an almost continuous line as in figure 1. The udder should be large when distended with milk. It should not be fleshy and, immediately after milking, should be small, hanging in folds or wrinkles. The "milk-veins" running from the udder on either side of the abdomen, should be large and the "milk wells", or openings where these veins enter the body, should also be large.

The dairy cow should be free from fleshiness and angular in shape, yet she should have a strong constitution and in general appearance have a thrifty and healthy look. (See Figure 1.)

Keeping a record.—While the type of the cow is an indication of her value as a dairy animal it is not to be relied upon as the only means of determining the relative merits of the individuals in the herd. As soon as we have selected the cows that are to be used as the foundation of a herd, a record of each cow should be kept. Such a record will enable us to distinguish between the profitable and unprofitable cows in the herd, to dispose of the latter, to raise the calves of only the best cows, to feed more intelligently, and in general, to rapidly improve the standard of the herd. It is practically impossible for a farmer to buy first class cows at a reasonable price. The owners of such cows usually recognize their value and will not part with them

FIGURE 1.

a. Good Dairy Type.



b. Poor Dairy Type.

except at very high prices. About the only way then to secure such a herd is by using good bulls, and by careful selection and management. The record of each cow should include the feed eaten, the yield of milk and the quality of the milk.

Amount of feed.—To determine this it is necessary to know the amount of feed eaten each day. A fairly accurate method may be obtained by having a measure for the grain feeds with marks indicating the amount of feed to be used. We have found a quart and a half gallon measure with divisions indicating each pint very convenient for this purpose. The hay or other roughage may be weighed for a few times and the daily amount estimated from these weighings. The hulls may be measured in a half-bushel measure. Such a system of feeding requires practically no more time than the one practiced by most dairymen and is much more useful. It not only enables us to know at the end of the month what each cow has consumed, but has made it possible for us to feed the same amount each day, which is very important in feeding the dairy cow.

Quantity of milk.—The only absolutely accurate method of determining the amount of milk produced is to weigh and record every milking. Owing to the fact that we have found that the milker takes more interest in his work, takes a greater pride in keeping up the yeild of milk, and is more alert in seeing any abnormal condition of the cow, we would recommend this method to all who own cows. Some may conclude without trial that this would require too much time, but the experience of those who have adopted the practice is that the milk of from three to six cows can be weighed and recorded in one minute. The scales and milk sheet should be placed convenient for the milker.

FIGURE 2. MILK SCALES.

Figure 2 shows a pair of milk scales that can be adjusted so that the indicator will stand at the 0 mark when the empty pail is hanging on the scales. These scales cost from $3.00 to $4.00. However, a cheap spring balance costing from 25 to 50 cents will answer.

FIGURE 3.

Milk Record of College Herd.

FOR MONTH ENDING FEBRUARY 28, 1906.

DATE.		Eunice	Grade 19	Margery	Minka	Loui	Reddy	Agnes	Grade 18	Grade 103	Grade 282	Grade 319
Feb. 1	A. M.	12	16									
	P. M.	10	14									
2	A. M.	12	17									
	P. M.	11	14									
3	A. M.	13	15									
	P. M.	10½	13									
4	A. M.	13	17									
	P. M.	10	12									
5	A. M.	11	17									
	P. M.	10	14									
6	A. M.	12	19									
	P. M.	12	13									
7	A. M.	11	19									
	P. M.	11	13									
8	A. M.	12	17									
	P. M.	10	12									
9	A. M.	12	17									
	P. M.	10	12									
10	A. M.	11½	17									
	P. M.	10	11									
11	A. M.	12	19									
	P. M.	10	11									
12	A. M.	12	17									
	P. M.	10	14									
13	A. M.	12	17									
	P. M.	9½	13									

FIGURE 3—*Continued.*

Date.		Eunice	Grade 19	Margery	Minka	Loui	Reddy	Agnes	Grade 18	Grade 103	Grade 282	Grade 319
Feb. 14	A. M.	11	18									
	P. M.	9	14									
15	A. M.	11	16½									
	P. M.	10	13									
16	A. M.	13½	18									
	P. M.	11	12									
17	A. M.	13½	18									
	P. M.	10	14									
18	A. M.	13	19									
	P. M.	10	15									
19	A. M.	13	16									
	P. M.	12	14									
20	A. M.	12	16									
	P. M.	11	14									
21	A. M.	12	17									
	P. M.	10½	14									
22	A. M.	13	19									
	P. M.	11	14									
23	A. M.	14	19½									
	P. M.	11	14									
24	A. M.	14	18½									
	P. M.	11	12½									
25	A. M.	13	19½									
	P. M.	10	16									
26	A. M.	12	17									
	P. M.	11	13½									
27	A. M.	13½	19									
	P. M.	12	15									
28	A. M.	13½	19									
	P. M.	11	16									
Total..	....	642	869									

Quality of the Milk.—Not only will different cows vary in the amount of milk they give, but they will also differ greatly in the richness or per cent. of butter fat in the milk. A simple and practical method of determining the per cent. of butter fat is, therefore, desirable. The Babcock tester furnishes us with the means of such a test. The milk of each cow should be tested once a month and should include a sample of milk for the entire day.

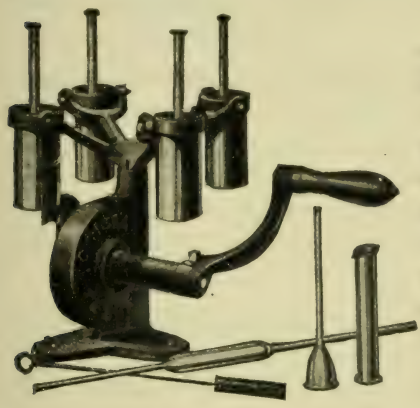


FIGURE 4.
BABCOCK TESTER.

The following equipment is necessary for making the test: A Babcock machine, test bottles, one 17.6 cc pipette for measuring the milk, one 17.5 cc acid measure, and a small quantity of sulphuric acid with a specific gravity of 1.82. This machine with complete outfit for testing from four to twelve samples at a time can be bought from any reliable Creamery Supply Co. for from $4.00 to $10.00 with full directions for operating so that any intelligent person can operate it successfully. (See Figure 4.)

Directions for making the test.—In order to get a correct sample of the milk, we should provide ourselves with as many pint or quart jars as there are cows to be tested. Ordinary fruit jars are very convenient for this purpose. Each cow should have a name or number which should be placed on the jar in which the sample of milk from this cow is to be placed. As soon as the cow is milked, weigh the milk and mix thoroughly by pouring from one bucket to another two or three times, then take out about one-half of a pint and put into the jar. Place cover on jar and set in a cool place until evening. At the next milking we take out the same quantity of milk from this cow's milk as before, after it has been weighed and thoroughly mixed, and place this in the same jar. This gives an approximately correct sample of the milk for one day. This is repeated for each cow to be tested.

After samples of milk have been procured from all the cows to be tested, the fat contents may be determined as follows: Mix the milk of each cow thoroughly by pouring from one jar to another several times. The 17.6 cc pipette is then filled immediately by sucking the milk into it until it has risen a little above the mark on the stem

of the pipette. The forefinger is then placed over the end of the pipette which prevents the milk from running out. By slightly releasing the pressure the milk is allowed to run out until just level with the mark. The point of the pipette is next placed in the neck of the test bottle and the milk allowed to flow slowly down the walls of the test bottle. This is accomplished better by holding the pipette and bottle at an angle of about forty-five degrees, as by so doing there will be less danger of causing the milk to fill the neck of the test bottle and run out at the top.

Adding the acid.—Fill the acid cylinder up to the 17.5 cc mark with sulphuric arcid, and holding the bottle as before, pour in slowly. The acid being heavier than the milk will sink to the bottom of the test bottle. Care should be taken in handling the acid not to allow it to be wasted on the hands or clothing because of its corrosive nature. After adding the acid, the milk and acid are well mixed by giving the bottle a rotary motion.

Whirling the bottles.—The bottles are next placed in the machine or Babcock tester and balanced by having the same number on each side and whirled for four or five minutes at the speed indicated by the manufacturer of the machine. Allowing the machine to stop, the bottles are filled with warm water up to the neck of the test bottle and whirled again at full speed for two minutes. Hot water is again added so that the top of the column of fat will be somewhat below the top of the scale on the neck of the test bottle and the bottles whirled for one minute.

Measuring the fat.—The amount of fat in the bottle is measured by the scale on the neck. Each division on the scale represents two-tenths of one per cent. of fat and the space filled by the butter fat shows the per cent. of butter fat in the sample tested. The fat is read from the lower line of separation to the extreme top of the fat column. (See Figure 4.) The difference between the two readings will give the per cent. of fat in the milk.

The total butter fat for the month is obtained by multiplying the amount of milk given during the month by the per cent of fat. The amount of butter is usually estimated by multiplying the pounds of fat by $1\frac{1}{6}$. The fat is increased by this amount on account of the water, curd, and salt that the butter contains. The following illustration will serve to show the method of determining the yield of butter for each cow. We find that a cow gives an average of 24

pounds of milk daily and the Babcock test shows that it contains 4.8 per cent. of butter fat. Multiplying 24 pounds by 4.8 per cent. we have 1.15 pounds of butter fat. But by careful management we have one-sixth more butter than we have of butter fat. Multiplying 1.15 pounds of fat by $1\frac{1}{6}$ we have 1.34 pounds of butter per day as the estimated yield of this cow. The sample of milk for testing should be taken about the middle of the month rather than at the beginning or end as it will more nearly represent the true test of the milk for that month.

Difference in individual cows.—In order to show the value of such a record as the above, we give the average results of three years work with two cows out of the same dam. These two cows give very nearly the same quantity of milk per day immediately after calving and without a record one might easily presume that there would be but little difference in the profits from the two cows. The average yield of one was 5,003 pounds of milk and 294 pounds of butter. The cost of feed for this cow was $34.20 a year. The average yearly yield of the other cow was 5,725 pounds of milk and 428 pounds of butter. The yearly cost of her feed was $30.44. While the second cow did not give a very much larger yield of milk than the first, she produced over one-third more butter and the profits from her were over twice as much as from the first cow.

If the best and poorest cows in the herd had been compared the difference would have been still more striking, but here were two cows standing side by side and would, no doubt, have been considered equally profitable had no record been kept of their yields.

Feeds for the dairy cow.—While the selections of the cow is very important, it is also necessary to feed intelligently in order to secure the maximum yield at the least cost for feed consumed. The farmer should know the composition of the feeds used and the combination of feeds that will give the best results. There are three groups of substances that should be considered in making up the feed for the dairy cow. They are protein, carbohydrates, and fat.

Protein includes those materials which contain nitrogen and is the most expensive part of the feed. Lean meat contains large quantities of protein and, among our most common feeds for cattle, cottonseed meal is rich in protein. It is absolutely necessary for the dairy cow to have a certain amount of protein in her feed. It enters into the composition of the milk, blood, muscle, hair, and nerves and there is no other substance that can take its place.

Carbohydrates include the starch, sugar, gums, and the fiber of feeds and form the largest part of all vegetable foods. They furnish heat and energy and fat to the body.

Fat includes the fat, wax, the green coloring matter of plants, etc., and serves the same purposes in the animal body as the carbohydrates. It has a heating value 2.25 times as great as the carbohydrates.

Digestible matter.—Not all of the protein, carbohydrates, and the fat are digestible and as only the digestible portion is of any nutritive value, it is necessary to know the amount of digestible protein, carbohydrates, and fat in a given quantity of feed.

In the following table we give the dry matter, and digestible protein, carbohydrates, and fat contained in 100 pounds of each of the feeds in general use. From this table the farmer may select such feed-stuffs as will give desirable results in feeding.

Dry Matter and Digestible Nutrients in 100 Pounds of Feed-stuffs.

Name of Feed.	Dry Matter	Protein	Carbo-hydrates	Fat
Green Forage—				
Pasture grass	20.0	2.50	10.20	0.50
Corn fodder	20.7	1.10	12.08	0.37
Bermuda grass	33.0	2.60	14.80	0.30
Johnson grass	34.0	2.40	16.50	0.50
Lespedeza (Japan Clover)	30.0	2.70	14.40	0.60
Crab grass	33.0	1.90	14.00	0.60
Sorghum	20.6	0.60	12.20	0.40
Alfalfa	28.2	3.90	12.70	1.00
Cowpea	20.7	1.80	8.70	0.20
Soja bean	24.9	3.20	22.00	1.00
Oat fodder	37.8	2.69	22.66	1.04
Rye fodder	23.4	2.05	14.11	0.44
Barley fodder	21.0	1.90	10.20	0.40
Wheat fodder	36.0	2.80	18.00	0.90
Orchard grass	27.0	1.91	15.91	0.58
Red top grass	34.7	2.06	21.24	0.58
Kentucky blue grass	34.9	3.01	19.83	0.83
Teosinte	25.0	2.40	13.50	0.20
Red clover	29.2	3.07	14.82	0.69
Burr clover	25.0	2.60	17.00	0.50
Alsike clover	25.2	2.70	13.10	0.60
Crimson clover	19.1	2.40	9.10	0.50
Silage from—				
Sorghum	20.9	0.60	14.90	0.20
Corn	20.9	0.56	11.79	0.65
Cowpea	20.7	1.50	8.60	0.90
Alfalfa	27.5	3.00	8.50	1.90
Hay from—				
Bermuda grass	86.0	6.90	39.00	0.80
Johnson grass	85.7	6.00	41.40	1.20
Alfalfa	91.6	10.58	37.33	1.38
Cowpea	89.3	10.80	38.60	1.10
Hairy vetch	83.3	14.60	30.60	2.30
Red clover	90.3	6.58	35.35	1.66
White clover	90.3	11.46	41.82	1.48
Peanut	92.4	6.70	42.10	3.40
Burr clover	83.3	8.80	36.50	0.50
Crimson clover	91.4	10.49	38.13	1.29
Crab grass	86.0	4.30	36.40	1.50
Red top grass	91.1	4.82	46.83	0.95
Hungarian grass	92.3	4.50	51.67	1.34
Orchard grass	90.1	4.78	41.99	1.40
Timothy grass	86.8	2.89	43.72	1.43

DRY MATTER AND DIGESTIBLE NUTRIENTS IN 100 POUNDS OF FEED-STUFFS.
(*Continued.*)

NAME OF FEED.	Dry Matter.	Protein.	Carbo-hydrates.	Fat.
HAY FROM—				
Kentucky blue grass	78.8	4.76	37.33	1.95
Lespedeza (Japan clover)	86.0	7.80	41.40	1.80
Shredded corn stover	80.0	2.30	43.20	0.90
Corn blades (corn fodder)	80.0	4.00	40.80	0.60
Corn shucks	80.0	1.30	49.90	0.30
Cottonseed hulls	88.9	0.30	33.10	1.70
Wheat straw	90.4	0.40	36.30	0.40
Oat straw	90.8	1.20	38.60	0.80
Rye straw	92.9	0.60	40.60	0.40
Barley straw	85.8	0.70	41.20	0.60
ROOTS AND TUBERS—				
Sweet Potato	28.9	1.00	22.50	....
Irish Potato	21.7	0.90	16.30	0.10
Beets	13.0	1.21	8.84	0.00
Turnips	9.5	0.81	6.46	0.11
Rutabagas	11.4	0.88	7.74	0.11
Artichoke (Jerusalem)	20.0	2.00	16.80	0.20
GRAINS AND OTHER SEEDS—				
Cotton seed	89.7	12.5	30.0	17.3
Cottonseed meal	91.8	37.2	16.9	12.2
Cottonseed hulls	88.9	0.5	33.1	1.7
Corn, field	89.1	7.9	86.7	4.3
Corn and cob meal	84.9	4.4	60.0	2.9
Wheat	89.5	10.2	69.2	1.7
Wheat bran	88.1	12.2	39.2	2.7
Wheat shorts	88.2	12.2	50.0	3.8
Wheat middlings	87.9	12.8	53.0	3.4
Rice	87.6	4.8	72.2	0.3
Rice bran	90.3	5.3	45.1	7.3
Rice polish	90.0	9.0	55.4	6.5
Oats	89.0	9.2	47.3	4 .2
Rye	88.4	9.9	67.6	1.1
Barley	89.1	8.7	65.6	1.6
Malt sprouts	89.8	18.6	37.1	1.7
Brewers' grains (wet)	24.3	3.9	9.3	1.4
Brewers' grains (dry)	91.1	14.7	36.6	4.8
Flax seed	90.8	20.6	17.1	29.0
Linseed meal (old process)	90.8	28.8	32.8	7.1
Linseed meal (new process)	89.9	28.2	40.1	2.8
Cowpea, seed	85.2	18.8	54.2	1.1

Feeding standards.—A number of investigators have made a study of the amount of digestible protein, carbohydrates and fat needed by different animals and as a result have gotten up what are called feeding standards, showing the results of their observation and experience. These standards are of value to the farmer as indicating how he may combine the feeds at his disposal in such a way as to secure the best results. The feeding standard most widely used is known as the Wolff-Lehman standard and is as follows:

Wolff-Lehman Feeding Standard.

PER DAY AND PER 1000 POUNDS LIVE WEIGHT.

MILCH COWS WHEN GIVING:	Dry Matter	Digestible Protein	Digestible Carbohydrates.	Digestible Fat.
11 lbs. of milk daily	25.0	1.6	10.0	0.3
16½ lbs. of milk daily	27.0	2.6	11.0	0.4
22 lbs. of milk daily	29i0	2.5	13.0	0.5
27½ lbs. of milk daily	32.0	3.3	13.0	0.8

A ration is the amount of feed given an animal in one day.

Nutritive ratio is the ratio between the digestible protein and the digestible carbohydrates and fat. It is found by multiplying the fat by 2¼, adding the product to the carbohydrates and dividing the sum by the protein.

A Balanced Ration is one that contains the proper amounts of protein, carbohydrates, and fat.

A Narrow Ration is one containing a large porportion of protein as compared with the carbohydrates and fat.

A Wide Ration is one containing a large proportion of carbohydrates and fat as compared with the protein.

Calculating rations for dairy cows.—To show how the table of digestible nutrients and the feeding standards are used, the following illustration is given. As a trial ration for a cow giving 22 pounds of milk we will use 15 pounds of cottonseed hulls and 3 pounds of cottonseed meal. We find the following amounts of dry matter and digestible nutrients in the above amounts of feed:

Cottonseed Hulls.

	In 100 pounds.		In 15 pounds.
Dry matter	88.9	÷ 100 x 15 =	13.33
Protein	0.42	÷ 100 x 15 =	0.06
Carbohydrates	30.95	÷ 100 x 15 =	4.64
Fat	1.69	÷ 100 x 15 =	0.25

Cottonseed Meal.

	In 3 pounds.		
Dry matter	91.8	÷ 100 x 3 =	2.75
Protein	37.2	÷ 100 x 3 =	1.12
Carbohydrates	16.9	÷ 100 x 3 =	0.51
Fat	12.2	÷ 100 x 3 =	0.36

Arranging these in a table with the Wolff-Lehman standard for comparison, we have:

First Trial Ration for Dairy Cow Weighing 1000 Pounds and Giving 22 Pounds of Milk Daily.—Wolff-Lehman Standard.

Feed Stuffs	Dry Matter	Digestible Nutrients			Nutritive Ratio
		Protein.	Carbo-hydra's.	Fat.	
Cotton seed hulls, 15 lbs.	13.33	0.06	4.64	0.25	
Cottonseed meal, 3 lbs.	3.67	1.49	0.68	0.49	
First trial ration	17.08	1.18	5.15	0.61	1: 5.5
Standard ration	29.00	2.50	13.00	0.50	1: 5.7

We find that our trial ration falls considerably below the standard in all the ingredients, except the fat. To correct this we will add 13 pounds of Johnson grass hay and 4 pounds of wheat bran

Second Trial Ration for Dairy Cow Weighing 1000 Pounds and Giving 22 Pounds of Milk Daily.

Feed Stuffs.	Dry Matter	Digestible Nutrients.			Nutriti'e Ratio.
		Protein	Carbo-hydrates	Fat.	
Johnson grass hay, 13 lbs.	11.14	0.78	5.38	0.16	
Cottonseed hulls, 3 lbs.	13.33	0.06	4.64	0.25	
Cottonseed meal, 3 lbs.	2.75	1.12	0.51	0.34	
Wheat bran, 4 lbs.	3.52	0.49	1.57	0.11	
Second trial ration	30.74	2.45	12.10	0.86	1:5.7
Wolff-Lehman Standard	29.00	2.50	13.00	0.50	1:5.7

While this ration does not agree fully with the standard in regard to all of the nutrients, it is sufficiently near the standard to furnish a satisfactory ration for a dairy cow weighing about 1000 pounds and giving 22 pounds of milk daily. It must be remembered that such standards are only to be used as guides and that oftentimes it may be the part of economy to give rations differing materially from the standard.

Selection of feeds.—In the selection of feedstuffs, the farmer should be governed by the market price of the different feeds as well as their feeding value. In general, we may say that the nearer the farmer can come to growing all the feeds necessary for the animals on his farm, the more profitable will be the results. In comparing the values of the different grain feeds at this station we have found that in a fairly well balanced ration, one ton of cottonseed meal has a feeding value equal to two tons of corn meal, one and one-half tons of wheat bran, or one and seven-tenths tons of cotton seed. It will thus be seen that in cotton seed and cottonseed meal we have feeds that will compare favorably with those grown in any section of the country, but it would not be wise to rely upon these as our only grain feeds, because when fed in too large quantities they will have an injurious effect upon the cow. In fact, from our own observations we are led to believe that many cattle are fed too much cottonseed meal, especially at the time of calving. The Alabama station reports some results with rations for dairy cows, showing that one ton of vetch hay is equal to a ton of wheat bran, and that one ton of cowpea hay is equal to seventeen hundred and twenty pounds of wheat bran. Both of these crops can be grown successfully in nearly every portion of this State, and can be made to take the place of much of the wheat bran that is now used as a feed for dairy cows and can be produced at a much less cost than the market price of the bran. Where these crops are grown we have the further advantage of adding large quantities of fertilizing ingredients to the soil in the roots of such crops. The benefits of growing cowpeas, hairy vetch and other leguminous crops, which have the power of taking in the free nitrogen of the air and storing it in the soil, thereby increasing the yield of succeeding crops, is recognized by the progressive farmers and these crops are often grown for this purpose alone. The following rations furnish the materials in about the proper proportions for the production of milk. The amounts are calculated for a cow giving from two and one-half to three gallons of milk a day and weighing about 800 to 1000

pounds. For a cow giving a larger amount the ration should be increased, and for smaller yields it should be reduced:

RATION 1.—Johnson grass hay, 13 pounds; cottonseed hulls, 15 pounds; cottonseed meal, 3 pounds; wheat bran, 4 pounds.

RATION 2.—Cowpea hay, 15 pounds; corn silage, 40 pounds; wheat bran, 5 pounds.

RATION 3.—Cottonseed hulls, 20 pounds; Cottonseed meal, 4 pounds; wheat bran, 5 pounds.

RATION 4.—Cowpea hay, 10 pounds; cottonseed hulls, 15 pounds; cottonseed meal, 3 pounds.

RATION 5.—Cowpea hay, 10 pounds; bermuda grass hay, 10 pounds; wheat bran, 3 pounds; cottonseed, 6 pounds.

RATION 6.—Bermuda grass hay, 18 pounds; cottonseed meal, 2 pounds; wheat bran, 3 pounds; corn and cob meal, 3 pounds.

RATION 7.—Cowpea hay, 15 pounds; cotton seed, 8 pounds; corn meal, 6 pounds.

RATION 8.—Sorghum hay, 20 pounds; cowpea hay, 10 pounds; cottonseed meal, 3 pounds

RATION 9.—Alfalfa, 15 pounds; cottonseed hulls, 12 pounds; cottonseed meal, 3 pounds.

RATION 10.—Crab grass hay, 15 pounds; cowpea hay, 12 pounds; cotton seed, 6 pounds.

Bulk of feed.—With the cow it is necessary that the feed should not consist entirely of concentrated feeds. There must be a certain amount of roughage fed in connection with the grain to secure the best results. A cow, when dry, may be fed entirely on a good quality of hay without loss in weight, but when "heavy with calf" she should have either pasture or grain in addition.

Palatability.—Besides furnishing the necessary kind and amount of feed to the cow, we must consider the palatability of the feed. If it is not relished by the cow and she fails to eat a sufficient amount to produce the milk that she is capable of giving, poor results may be obtained. Such results may come from feeding a poor quality of hay that has been injured or that has become too woody before

cutting. Some cows are very fond of cotton seed, others eat them but sparingly. The successful feeder will carefully watch his cows and give them such feeds as will produce the best results. Succulent feeds during the winter months are helpful in keeping up the flow of the milk and where the farmer has a sufficient number of cows (fifteen or more) the best method of providing such a feed is probably by the use of the silo. With the silo, he can preserve the green feed in the form of silage and can use this to take the place of the pasture grasses during the winter.

There is probably no way the corn crop can be used to better advantage than by putting it into the silo. In this case the entire plant is cut when the ear begins to glaze. By such a method the stalk as well as the ear is utilized as a food. While corn is probably our best crop for silage, sorghum, cowpeas, alfalfa, and other crops may be used. The advantages of the silo are many and, in dairy sections, the number of silos is constantly increasing.

Pastures.—Perhaps pasture grasses furnish the cheapest source of feeds for cattle, and every owner of cows welcomes the time when the cows can be turned into a good pasture where they can get practically all the feed necessary for the maximum amount of milk that they are capable of giving. By the term pasture, however, we mean a place that has been properly prepared so that the cow will not be compelled to walk all day in order to get a small amount of grass but it should be so that she can have all that she can make profitable use of near at hand and have plenty of time to digest and convert this food into milk.

It is only under such conditions as these that the cow is able to do her best and so we should, in our farming operations, plan for the pasture as well as for the field crops.

We have tried to have a continuous pasture here for as many months in the year as possible and from our experience and observation believe that it is possible to have a good pasture in most places in the State for about ten months in the year. We plant in the fall a mixture of turf oats and hairy vetch, about three pecks of the oats to one of the vetch and sow broadcast at the rate of one and one-half to two bushels to the acre. Such a mixture furnishes very early grazing in the spring and lasts until about the first of May when the cattle should be taken off and the crop given a chance to reseed itself. Usually a good yield of oats may be secured after grazing and as a

rule there will be a sufficient amount of vetch seed left on the land to give a perfect stand the following fall. We have land that was seeded four years ago to this vetch that has a better stand now than in any previous year. A pasture composed of a mixture of Bermuda, lespedeza, white and burr clover should afford good grazing by the time the cattle are taken off the oats and vetch. If the land is good and the pasture is not grazed too closely, the cows will probably get all the green feed needed until fall, and in some sections of the State until December. The pastures should be divided so that the cows may be changed from one to the other. Such a method will enable us to carry more cattle on a given area and the cows will be able to get sufficient food to satisfy their requirements with less exertion than if the entire pasture is under one enclosure. In addition to the plants mentioned above as suitable for pasture, there are a number of others such as, Johnson grass, orchard grass, red top, Kentucky blue grass, large water grass (Paspalum dilitatum), carpet grass, and numerous native grasses. Johnson grass has given very satisfactory results here where we have not grazed it too closely, but continuous close grazing so weakens its vitality that it soon becomes of but little value as a pasture grass. Orchard grass makes an early growth in the spring and stands pasturing well, especially where there is considerable shade in the pasture. Carpet grass grows well in the southern part of the State and is one of the most desirable plants for that section that can be grown for pasture.

Our results indicate that there is very little increase in the yield of milk and butter by feeding grain to cows when on good pasture—not enough to pay for the feed eaten. Cotton seed or cottonseed meal will, however, make the butter firmer and it will stand shipment better during the hot weather than when no meal or seed are fed.

Soiling crops.—Often in the fall we have a dry period that may extend over several weeks, during which time the pastures become insufficient to furnish enough food for a full flow of milk. If there is not some arrangement made to give the cows extra feed during this time the flow of milk may be decreased to such an extent that it will be impossible to bring the yield back to the original amount. To provide for such an emergency some soiling crop should be grown; that is, a crop that may be cut and fed green to the cows during this season of short pasture. One of the best, surest and safest crops that we have found is sorghum planted thick and with the rows not over two feet apart. The sorghum may follow a crop of oats or

some other early crop and will withstand dry weather better than most other plants. Cowpeas are good and corn may be used satisfactorily on land that will produce fair to large yields.

Preparation of feed.—If the cost is not too great it is advisable to have the grain feeds ground for the cows. The results of experiments would indicate that it is better to give the feed dry rather than in the form of a slop and that as a rule it does not pay to cook the feed; in fact, many feeds are made less digestible by cooking. There are probably some exceptions to this; for instance, cotton seed are much more palatable to most cows after cooking than when fed raw, and we usually secure more desirable results by cooking or steaming the seed.

Care of the cow.—Anything that adds to the comfort of the cow will increase her yield. No matter how abundant or satisfactory the feeds may be, good returns will not be secured unless the cow receives proper treatment. Comfortable barns should be provided. In the South this does not mean expensive barns, but the cows should be made comfortable during the rains and cold weather of winter.

Regularity and kindness.—There should be a regular time for feeding, watering, and milking the cows. A large part of the milk is formed at the time of milking and anything that tends to excite the animal at this time will have a marked effect on both the yield and quality of the milk. If possible the same milker should milk the cow every time as a change of milkers will often cause a decrease in the yield of milk.

We give the following illustration to show the effect af excitement on the yield: One of the cows in our barn being of a very nervous temperament became very much excited on account of a number of visitors in the barn at milking time. At that milking she gave only about one-half as much milk as usual. A sample of this milk was tested by the Babcock test and it was found to be much poorer than her normal milk. The result was that for this milking she gave only about one-third as much butter as on the previous evening when she was in a normal condition. Hurrying cows to and from the pasture, chasing them with dogs, beating or speaking roughly to them should not be tolerated.

The cow should, if possible, be dried off about six to ten weeks before calving and the best feed for her during this interval is good

pasture. If this is not available, then she should be fed on some laxative feed, such as wheat bran with such roughage as she will consume. Silage is also good as a feed during this time. After calving she should be fed lightly, green feeds being preferable. Very little cotton seed or cottonseed meal should be given. As soon as the udder is in good shape and the cow appears to have recovered from the effects of calving, the feed should be gradually increased until the cow no longer responds to an increase in the feed. The care and management of the cow for the first two or three months after calving will largely determine her yearly production. It is, therefore, highly desirable to pay particular attention to her during this time. If the feed is increased too rapidly the cow is likely to get off of feed or convert a part of it into body fat. In either case a decrease of the flow of milk will usually follow.

Water.—Good pure water should be available for the dairy cow. The cow should either have free access to the water, or she should be watered regularly twice each day. Where ponds are used care should be taken to see that the water does not become polluted by the cows standing in it as they are likely to do during the hot summer weather. A very good plan is to have a pipe leading off some distance from the pond to a trough and not allow the cows in the pond at all.

Salt.—Experience and observation teach us that the cow should be salted regularly. Perhaps one of the most satisfactory ways is to keep rock salt within reach of the cow, provided it is protected from the rain. It is not a very good plan to mix it with the feed for then the cow may be compelled to eat more than she requires.

Care of the bull.—The practice of allowing the bull to run with the herd is objectionable. In the first place it is much harder to keep him in good, thrifty, active condition than if he had a separate enclosure; second, a complete record of the herd necessitates a knowledge of the time that each cow was served. The young bull calf should be given foods rich in muscle and bone making material and should be kept in good growing condition. The bull should not be required to serve too many cows, especially while young. Ten to fifteen as a yearling and thirty to forty after two years old will not overtax him if he is kept separate from the herd. As a rule the bull is a dangerous pet, and while he should be treated kindly, he should never be given an opportunity to gain any advantage over his owner.

Raising calves for the dairy. If we wish to see the influence that man has had on the improvement of cattle we have only to look at the different breeds that have been developed from one common ancestry through his efforts. The skillful dairyman who breeds intelligently and gives the proper care and feed to his calves is the one who will constantly improve his herd.

The calf should be taken from its dam when from one to two days old. For the first two weeks it should be fed only on its mother's milk. Feed about eight to ten pounds a day. Where the centrifugal separator is used and sweet skim milk is available, the latter may be substituted for a part of the whole milk when the calf is two weeks old. By making the change gradually, skim milk may be substituted for all of the whole milk by the time that the calf is from three to four weeks old. As the fat or cream has been removed from the skim milk, it is necessary to replace this with some food. For this, we have found a mixture of equal parts by weight of corn meal, wheat bran, and oat meal very satisfactory. About two table spoonfuls should be mixed with the skim milk just before it is fed. This can be gradually increased as the calf grows older. Regularity is a necessary condition to success in calf raising. The calves should be fed at the same time each day. Very little more skim milk should be fed than whole milk when the change is made and it should always be fed warm. It should be about the same temperature as the milk when first drawn from the cow, and should be perfectly sweet. The feeding pail should be kept scrupulously clean by scalding once a day. The calf should be taught to eat as soon as possible, which may be done by putting a little meal in its mouth just after feeding the skim milk. A mixture of bran, oats and corn meal makes a desirable feed for the calf. It should be allowed to eat all the hay it will. The calf should be kept in a comfortable barn during cold and rainy weather. While it should not be fat, it should be kept in a thrifty growing condition.

Mississippi Agricultural Experiment Station.

BULLETIN No. 96.

INSECTS AND DISEASES LIABLE TO BE INTRODUCED INTO MISSISSIPPI.

By Glenn W. Herrick.

Figure 1.—Crown gall on the roots of young peach trees taken from the nursery row. (Photo by author.)

AGRICULTURAL COLLEGE, MISSISSIPPI.
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INSECTS AND DISEASES LIABLE TO BE INTRODUCED INTO MISSISSIPPI.

The rapidly growing fruit raising and trucking interests of the State are being accompanied by new and increasingly complex problems. One of the more important of the present day problems confronting the fruit grower and trucker is the danger of obtaining injurious insect pests and diseases on the young trees and plants that he buys from nurserymen; nor are the nurserymen to be held entirely responsible for diseased stock. In many cases it seems almost impossible to keep stock free from diseases because the latter are so widely distributed and so insidious in their attacks. Moreover, it is very often the case that an insect or a disease does not manifest itself on a young tree, having just begun its attack, and consequently it is impossible to know that a tree or plant is affected until it becomes considerably older. Again, it is practically impossible to examine minutely every plant or tree that leaves a nursery and it is certainly not a very difficult thing for a diseased specimen to be included unconsciously among healthy ones. There must be examinations and careful ones, at both ends of the line—at the nursery and at the farm. Moreover, in order to make an intelligent examination, a fruit grower or trucker must be familiar with the pests and diseases that are dangerous. It is the purpose of this bulletin to give information that will enable purchasers of nursery stock to recognize and eliminate infested and diseased trees and plants.

The following insects and parasitic diseases are very liable to be obtained on nursery stock and are considered dangerous. If any one of them is suspected to be present on the stock purchased, such trees or plants should either be destroyed or treated as we shall hereafter indicate:

San José scale insect (Aspidiotus perniciosus Com.)
The new peach scale (Aulacaspis pentagona Targ.)
The woolly aphis of apple (Schizoneura langeira Hausmann.)
The strawberry root louse (Aphis forbesi Weed.)

The Mexican cotton boll weevil (Anthonomus grandis Boh.)
Black knot of plum (Plowrightia morbosa, Schw.)
Crown gall (Dendrophagus globosus Toumey.)
Rosette of peach and plum.

The San José Scale.

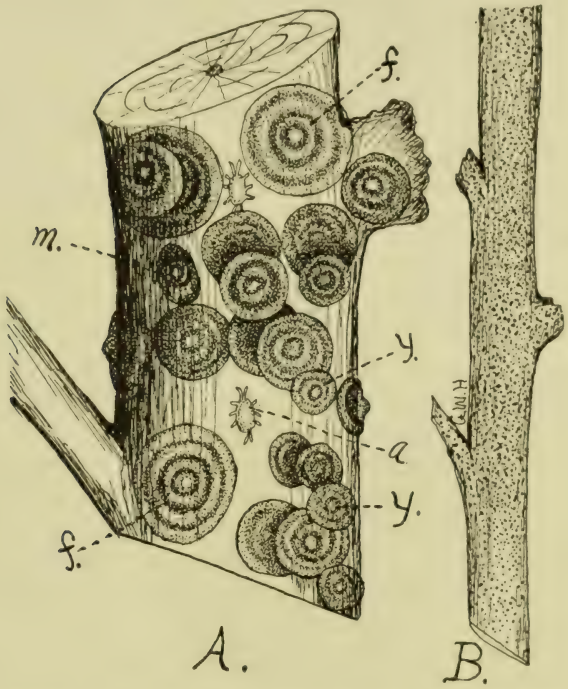

FIG. 2.—A, scales on branch; f, female scale; m, male scale; y, young scales; a, young, unprotected scale insect—all greatly enlarged. B, branch showing scales as they appear to the unaided eye. (Original.)

Probably no single insect in the United States has been the subject of more discussion and experimentation than the San José scale (Aspidiotus perniciosus), and small wonder, for there is no insect that is capable of producing greater injury to the fruit interests of our country than this one. As near as can be determined, this insect was introduced into the grounds of Mr. James Lick, of San José, California, in the early seventies. It soon spread to adjoining orchards where it was found and first described by Professor J. H. Comstock in 1880,

who quickly recognized its capabilities as an orchard pest, for he named it perniciosus, the pernicious scale. By '86 and '87 it had been imported on fruit trees into eastern nurseries, and from this time began to spread over the East and South. Mr. Marlatt, of the United States Bureau of Entomology, has lately found this insect on native trees in a remote province of China where there seems to have been no introduction of foreign trees or fruit. He, therefore, concludes that the scale must be a native of China and that it has been introduced into this country on imported plants.

Description of the insect.—It must be borne in mind that the San José scale is a very small insect often smaller than the head of an ordinary pin. Moreover, the female, except for a few hours immediately after birth, lives beneath a hard, waxy scale and consequently is well protected. This scale is circular in outline, slightly conical, and about the size of a pin-head. The rate of increase is very great and from a single infestation thousands upon thousands of individuals may develop in a season and the tree may become literally covered from the trunk to the outermost branches in two or three years. The young scales are whitish in color, but later they turn dark and are hard to distinguish from the bark. It is difficult to find the scales on a tree at the beginning of an infestation, for they are, of course, few in number and very small; but later, when the insect becomes abundant, the branches assume an ash-gray color and present a scurfy appearance. The females are wingless but the males possess two delicate wings, and when mature crawl out from beneath their scales and fly away.

This insect has its mouth-parts modified into a long, slender beak, which is inserted through the outer bark into the tender tissues of the tree thus enabling the insect to suck the juices from the plant; and, where the scales are in abundance, the tree is greatly weakened or killed outright.

Life history.—The immature insects pass the winter beneath the wax scales. From the middle to the latter part of May, the young are produced in great numbers. They look like small yellow lice, and can be plainly seen with the unaided eye after they issue from beneath the scales and are actively crawling over the bark of the the infested plants. Instead of laying eggs the mother insect brings forth her young alive, after which she dies. In a short time after birth the young crawl out from under the old scale and begin scurry-

ing about over the tree in search of places to settle. In a few hours they settle down, insert their beaks through the bark, begin secreting a scale and growing in earnest. Messrs. Lowe and Parrott give 49.5 days as the average period of growth in New York, but I believe this period is somewhat shorter here although I have no absolute data on this particular point. If the brood in May, which I have repeatedly seen, is the first brood, and a brood appears every fifty days, there are certainly four broods in this latitude during a season. The last brood in autumn passes the winter in hibernation beneath scales.

Plants liable to infestation.—Peaches, pears, apples, plums, rose, pecan, elm, almond, apricot, maple, chestnut, corn, sugar cane, currant, persimmon, quince, raspberry, gooseberry, osage orange, hawthorne, willow, cherry, etc., are some of the plants affected with the San José scale insect.

Means of distribution.—Since these insects, males excepted, live a fixed life they are distributed entirely by outside agencies. High winds breaking off leaves and blowing them here and there scatter these pests to some extent. The young insects, no doubt, cling to the feet of birds and large insects and are carried from tree to tree. They become attached to the horses, harness, plows, cultivators, etc., used in cultivating the orchard and in this way are carried to other parts of the farm. The foregoing methods of distribution are those occurring over local areas. The spread of this insect from state to state is very largely due to its transportation on nursery stock—young trees, scions, buds, etc.—that may be infested with living scales. This is undoubtedly the manner in which the insects came into the United States, and it is the way by which it came into Mississippi.

We find it in Vicksburg on trees bought in Florida, in Guntown on trees from a nursery in Georgia, in Ellisville on trees from a nursery in Tennessee, and so it goes everywhere in the state. Mississippi has no law requiring the inspection of nursery stock and the fumigation of the same with hydrocyanic acid gas before entering the state. Such a law should be enacted at once to protect the fruit growers in the future from this insect and other pests and infectious diseases.

Precautions to be taken.—Every purchaser of fruit trees should demand that his trees be accompanied by a certificate of inspection from a competent entomologist to the effect that they are free from scale, and he should also demand a sworn statement that his trees have been fumigated with hydrocyanic acid gas. The buyer should

also examine the trees himself very carefully for the scale and destroy infested ones. If, after these precautions, the insect becomes present in the orchard, spray with the lime-salt-sulphur mixture (see page 15 for formula). Bulletin No. 90 of this Station will furnish full information regarding the manner of treatment for the retardation of development and extermination of the scale.

The New Peach Scale.

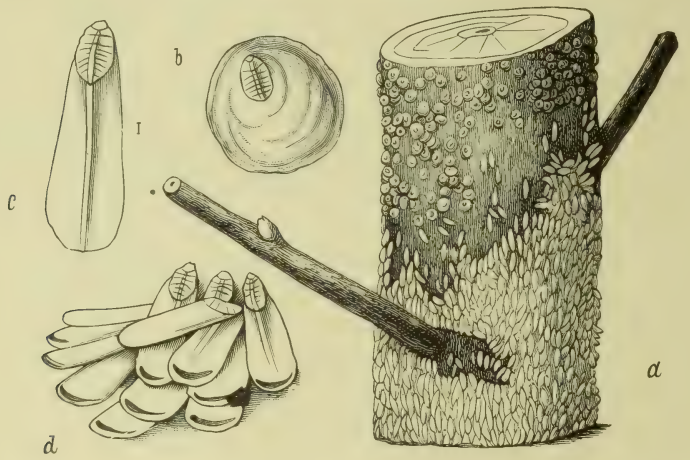

FIG. 3.—The new peach scale. a, branch covered with male and female scales—natural size; b, female scale; c, male scale; d, group of male scales—enlarged. (After Howard, Yearbook for 1894, Bureau Ent., U. S. Dept., Agriculture.)

This is often called the West Indian peach scale because it is thought that this insect came to the United States from the West Indies. It has been found in California, Massachusetts, Washington, D. C., Georgia, Alabama, Louisiana, and Florida. In Georgia it has shown its capabilities as a destructive insect, for Professor W. M. Scott records the destruction of 10,000 trees at Irby by this pest. If it should be introduced into this State and maintain its relatively destructive ability, it would prove a very serious pest indeed. Every fruit grower ought to become familiar enough with its general appearance to make a reasonable guess at it if present on his trees. A close watch for it should be maintained.

Description.—The adult female scales, as shown by figure 3, are more or less circular in outline but gray in color and are quite

inconspicuous on the bark of a tree. The scales of the male are, on the other hand, very noticeable because they are white and when the insects are abundant "the trees frequently appear as though whitewashed, from the masses of these male scales." The difference in shape of the scales of the two sexes is well shown by figure 3.

Life history.— Dr. L. O. Howard tells us that in Washington, D. C., the insect is found "only in the condition of the mature female." There are three generations in the latitude of Washington, and perhaps a fourth this far south, although no one so far as I know has investigated this point. At any rate, its rapidity of multiplication is amply sufficient to make it a dangerous pest and one for which we should be on the constant lookout.

Precautions to be taken.—The same precautions should be taken as in the case of the San José scale and the same remedies are applicable to the new peach scale.

The Woolly Aphis of Apple.

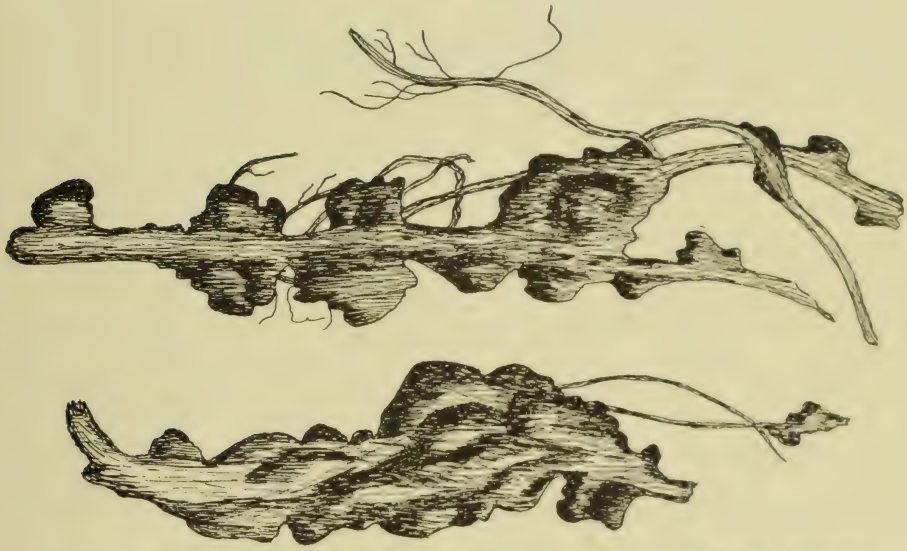

FIG. 4.—Roots from a two-year-old apple tree showing the knotty excrescences caused by the woolly aphis.

This insect exists on the apple tree in two forms. One form which is more often seen, is found on the trunk and branches and is known as the woolly louse of the apple. The other form lives on the

roots of the apple tree below the surface of the ground and is often known as the apple-root plant-louse. This is the more dangerous form and causes more injury than the aerial form. Moreover, the root louse is more difficult to detect and trees often die from the effects of this insect when the cause of death remains unknown. The individuals found on the branches secrete a bluish-white, cottony, substance and since these lice congregate in colonies they are easily noticed. These may be destroyed by two sprayings with kerosene emulsion.

The root lice also live in groups and secrete a similar cottony substance which makes them conspicuous when sought for. They also cause abnormal growths or knotty excrescences (Fig. 4) to form on the roots. These two characteristics, the *cottony substance* and the *knotty growth on the roots*, ought to enable one to recognize this insect at once.

Trees affected with the woolly root lice, appear sickly and do not grow vigorously. The leaves are less in number and have a pale yellow, sickly look. Finally the tree is blown down or dies.

Precautions.—Examine the roots of young apple trees carefully for the knotty growth and the cottony substance If evidences of the presence of this insect are noted it would be safest to destroy the affected trees. If it is desirable to save and plant the trees the roots should be thoroughly cleaned and then dipped for *one minute* in *kerosene emulsion.* See page 16 for directions for the preparation of this emulsion. In addition to dipping the roots in kerosene emulsion a liberal application of *tobacco dust* (not coarse stems or leaves, but dust) should be made about the roots and then covered with soil.

Strawberry Root-louse.

This is a very serious pest of strawberry plants when it once becomes established in a field. It is quite prevalent in Delaware and Maryland and has been found in Florida and Alabama, and in this State in one locality, at least. It does its greatest injury by destroying the small feeding roots of the plant and finally, when these are gone, the lice pass to the main roots and literally suck the life from the plant.

Life history.—In the late fall the mature lice deposit their eggs on the blades and petioles of the leaves of the plants where they remain all winter. In March and April the eggs hatch and these lice begin multiplying rapidly but still remain upon the leaves and stems of

FIG. 5.—Strawberry root-lice clustered upon small rootlets from crowns of plant—greatly enlarged. (After Sanderson, from Annual Report of Delaware Expt. Station.)

the plants for a month or more. Finally, in May (this time varies) a common species of ant, known as the small brown ant, begins to carry the young lice below ground and to place them along the roots of the plants in galleries that the ants have dug for them. In these situations the lice begin to live upon the juices drawn from the tender roots and finally become so numerous that they kill the plant.

The relation of these little ants to the lice is quite a remarkable one, yet by no means not the only case of the kind known. The lice secrete a sweet substance known as honey dew of which the ants are very fond. It is to obtain this honey dew that the ants care so solicitously for the lice.

To return to the life history, we find that the lice live throughout the summer, both upon the roots and leaves of the plant, until finally in late autumn the winter eggs are again laid upon the leaves, thus completing the life cycle.

Precautions.—We have seen that the eggs are laid on the leaves and remain there all winter. It is, therefore, very easy to get plants bearing the eggs if the nursery from which the plants come is troubled with this pest. Moreover, the lice are readily transported on young plants. As a result, one should demand a certificate signed by a competent entomologist, certifying that the plants in the nursery from which the purchase is being made are free from this louse.

If possible all purchased plants should be carefully examined for eggs or lice and if found infested, I would advise that they be destroyed. If it is desired to save infested plants, they should be dipped in a tobacco solution described on page 16.

The Mexican Cotton Boll Weevil.

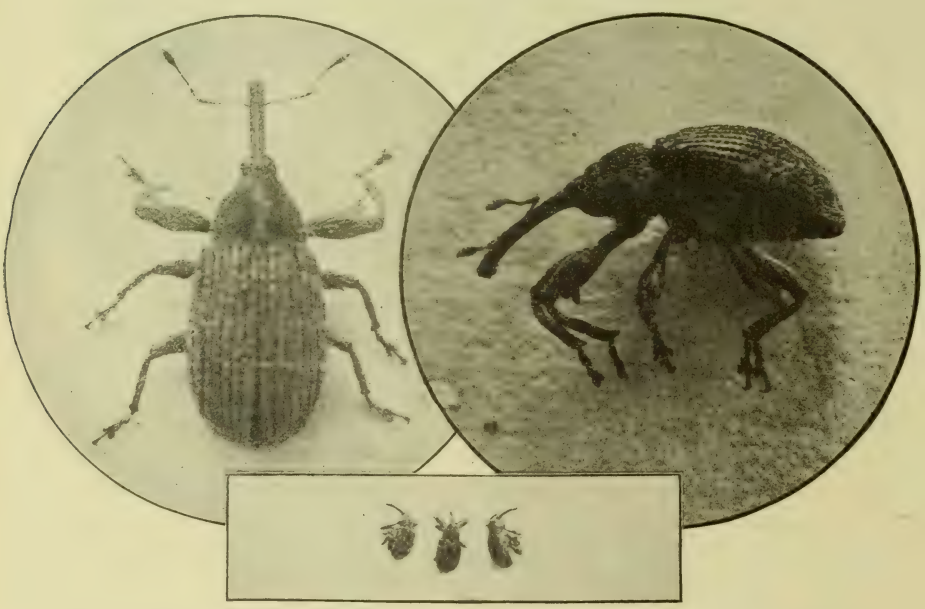

FIG. 6.—Mexican Cotton Boll Weevil—much enlarged above; natural size below. (Photo by author.)

It is probable that every one in the State has heard of the Mexican Cotton Boll Weevil and knows something of its habits, appearance, and injuries. I would emphasize the fact that it is a small, chocolate colored beetle. In the upper part of the picture it is shown very much enlarged. Below it is shown natural size from which it will be seen that it is no larger, if as large, as a common house fly. It

has a comparatively long proboscis, hard, horny, but smooth wing-covers, and two tooth-like projections on each front leg. The teeth can be seen in the picture and no other snout beetle with smooth wing-covers, so far as I know, has them.

Life history.—Briefly, the female weevil makes holes in the squares, or forms, and bolls of cotton with her snout and lays an egg in each hole, afterwards sealing the opening with a gluey substance. In a few days eggs hatch into a small white grub which greedily eats out the inside of the square or boll. The effect on the squares is to cause them to flare and to drop from the plant. In six to twelve days the grub becomes grown and changes to what we call pupa. After lying quietly in the fallen square a few days the pupa changes to the adult weevil which comes out ready in about five or six days to lay eggs again if it be a female. Bear in mind that this whole life history is passed in less than three weeks in the height of the season. As it becomes cooler toward fall the period is lengthened. The adult insects pass the winter by hiding away in protected nooks and crannies about fences, farm buildings, under leaves, rubbish, etc.

Precautions.—Although this insect will eventually reach our cotton fields yet we should do all in our power to retard its coming as long as we can. To do this no cotton seed, cottonseed hulls, cotton picking sacks that have been used or loose lint cotton and no live weevils, or bolls or squares containing eggs, larvae, or pupae should be brought from the infested portions of Texas and Louisiana into this State.

Black Knot of Plums.

This is a disease of American origin and first came into notice as a destructive one from the northeastern part of the United States. Now, it is widely distributed over the fruit growing area of this country.

Appearance—The name of this disease is descriptive of its appearance, for where a branch is attacked a black knot of varying size and shape is formed. Occasionally the knot encircles the branch, but more often it extends along one side of the affected member. If a young twig is affected, it is often bent from its normal direction. The knots sometimes become three or four inches long in a single season and in the course of several years become much longer. Bear in mind, that although young knots in the spring are velvety brown, toward fall they become black and remain that way ever afterward.

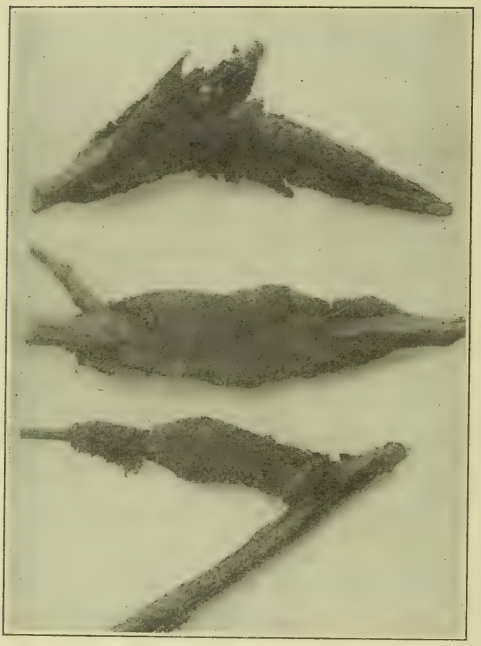

FIG. 7.—Branches of plum tree showing the knots produced by the black knot disease. (Photo by author.)

Also remember that black knot affects only the branches of a tree whereas the next disease of which we speak, crown gall, affects only the roots of trees.

Cause.—The disease is caused by a low parasitic plant, or fungus that attacks the sappy layer of the branches and causes the abnormal growths known as knots. The parasite during the season develops many thousands of spores which are blown by the wind or carried by other agencies to healthy trees where they probably start the disease anew.

Precautions.—Demand a certificate from an entomologist to the effect that there is no black knot in the nursery in which the trees were grown. Burn infected trees if by chance such are obtained and paid for.

Crown-gall and Hairy-root Disease.

Crown gall is a disease that affects plum, apricot, almond, and peach trees, and also apple and pear trees, grapes and raspberries, etc. I do not mean to say unqualifiedly that the same species of crown gall attacks all of the above named plants but it is quite evident that the disease on peach, called crown gall, is very similar to what we call crown gall on apple. It has been thought, and, I believe, is still held by some, that crown gall on the apple and peach are identical and inter-communicable, although recent work seems to show that the apple form is distinct from the peach form.

Fig. 8.—Hairy-root disease on apple. (Photo by author.)
See Figure 1 for crown-gall on peach.

Furthermore, it seems from the very late studies of Mr. George C. Hedgcock of the United States Department of Agriculture that we shall have to revise our ideas of the disease, crown gall. It seems probable that two distinct diseases have heretofore been confused under the one name crown-gall. These two diseases are now known as *crown-gall* and *hairy-root*. In figure 8, a typical example of the hairy-root disease on apple is shown. It affects grafted, budded, and seedling trees and is present to some extent in nearly every nursery growing apple trees.

Nature and appearance of Crown-gall and Hairy-root diseases. —Figure 1 shows the crown gall on peach. The disease is caused by a low parasitic plant or fungus that enters the tissue of the roots and causes an abnormal growth, in the form of a *knot*, or *gall*, just beneath the surface of the ground at the crown of the root.

The hairy-root disease of apple shown in figure 8 is easily recognized by the great number of small fibrous or hairy roots thrown out in clusters from the main root.

Figure 9 shows the normal, healthy roots of an apple tree unaffected with crown gall.

FIG. 9.—Normal roots of a healthy apple tree.

The effect of these diseases upon the length of life of affected trees and the contagiousness of them is yet a matter not fully determined. Until both these questions regarding the two diseases, however, are settled we should consider hairy-root disease and crown gall obnoxious and take every precaution to exclude them from our farms and orchards.

Precautions.—It is probably not always possible to detect these diseases on young trees, especially if the affection has not advanced far enough to produce galls or fibrous roots. In no case should one accept affected trees if they can be detected. If diseased trees are obtained they should be destroyed rather than planted.

Rosette of Peach and Plum.

This disease affects the peach, almond and plum and is quite prevalent in middle Georgia, the western portion of South Carolina and in eastern Kansas.

Appearance.—Affected trees show a characteristic appearance and the disease can hardly be overlooked or mistaken for anything else.

The leaf buds do not grow in length and consequently the leaves are crowded in a rosette or tuft and are small with inrolled margins. If a tree is seriously affected, the leaves appear in tufts, or rosettes on all the branches. The foliage finally turns yellow, then orange, or red and eventaully shrivels and dies. The death of the tree usually takes place before the end of the season.

Precautions.—Here again it is impossible to detect the disease in nursery stock because the leaves are gone. All one can do is to demand a certificate from the nursery declaring the trees to be unaffected. If rosette is discovered later on, every affected tree should be dug up and burned.

Spraying and Dipping Mixtures.

Lime-salt-sulphur Wash for Scale Insects.

This is a wash composed of lime, salt, and sulphur in the following proportions:

20 lbs. quick lime.
15 lbs. sulphur.
10 lbs. salt.
45 gallons of water.

How to make the wash.—In the first place, only the very best quality of quick lime should be used. In the second place, two iron kettles should be procured, each one holding at least 20 gallons, but the more they hold the better. The 20 pounds of lime should be slacked in three or four gallons of hot water in one of the kettles. When the lime is nearly slacked, but before it quits boiling, add the 15 pounds of sulphur and enough hot water to make a thin paste of the lime and sulphur. Stir the whole vigorously until they are thoroughly mixed, then boil actively for 45 minutes. After the lime and sulphur have *actually boiled* 45 *minutes* add the ten pounds of salt, and boil vigorously 15 minutes more. It will become necessary during the boiling to add a little hot water now and then to keep the Mixture thin. When through boiling add enough hot water to make 45 gallons, strain through a gunny sack, and apply hot.

The two kettles spoken of above, are intended to furnish a cooking outfit for a small orchard, say of a thousand trees. If one has a large orchard and is obliged to make this mixture on a large scale, it will be more economical to buy a boiler of 15 or 20 horse power.

A discarded threshing engine that is capable of standing a pressure of 5 or 6 pounds of steam will answer admirably. The boiler should be connected with half a dozen barrels, or more, if desired. Some of the barrels may be used for cooking the wash and some for heating the water. In this way, two or three wagons, each carrying a 45 gallon barrel spray pump, may be kept at work with no loss of time. It will be found most satisfactory to have the barrels mounted on a platform three or four feet high. Of course the mixture is made in the same manner and in the same proportion as when the kettles are used.

For pumps, nozzles, and methods of application see Bulletin No. 90 of this Station on the San José Scale.

Kerosene Emulsion.

This is a wash composed of kerosene oil, soap, and soft water and is made according to the following formula:

2 lbs. hard or soft soap.
4 gallons soft water.
8 gallons kerosene oil.

Place the soap (if hard soap is used it should be shaved in fine pieces) in the water over the fire and heat until it is thoroughly dissolved. Remove from the fire and add the oil. Then churn the mixture until it forms a creamy, white emulsion. It will probably take ten or fifteen minutes of vigorous agitation to produce the emulsion. When the creamy mixture is obtained, add enough water to make 80 gallons of mixture. This will give a ten per cent. solution which is as strong as the plants will stand. If, for any reason, the soap and oil fail to emulsify, the whole batch might as well be thrown away and another attempt made.

Tobacco Solution.

This is a wash or solution made by boiling one pound of tobacco leaves in one gallon of water for one-half an hour. If any of the water boils away, add enough, when through boiling to make a gallon. Immerse lice infested strawberry plants in this solution for one minute agitating them while in the water.

Bear in mind that only the lice are killed by this solution and that probably a majority of the eggs, if present, are not affected and may afterwards hatch and reinfest the plants. The safest way is not to set out infested plants.

Mississippi Agricultural Experiment Station.

BULLETIN No. 97.

INSPECTION AND ANALYSES OF COMMERCIAL FERTILIZERS

ON SALE IN THE STATE.

CHEMICAL LABORATORY.

AGRICULTURAL COLLEGE, MISSISSIPPI.

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INSPECTION AND ANALYSES OF FERTILIZERS

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INSPECTION AND ANALYSES OF COMMERCIAL FERTILIZERS

ON SALE IN THE STATE.

Introduction.—This bulletin summarizes the results of the inspection of fertilizers for the season of 1905-1906 Three circulars were issued during the busiest months, and all analyses for the season are now collected and published for the information of those interested in the fertilizer trade.

Inspectors go to all parts of the State where fertilizers are sold and they are careful to secure samples that are believed to represent accurately the goods marketed under the various brand names. A soon as an analysis of a sample is completed, the results are sent to the dealer, a duplicate going forward to the manufacturer at the same time

Results of the work.—While the number of analyses in the tables which follow is larger than in previous publications of the Department, it should be gratifying to find that the percentage of samples found to be below the guarantee in the calculated relative commercial value is lower than for a number of years. The following table compares the results for the past few seasons:

	Number of Samples Analyzed.	Number Found Below Guarantee in Relative Value.	Percentage Found Below Guarantee in Relative Value.
Season of 1902-1903	262	28	10.68
Season of 1903-1904	280	42	15.00
Season of 1904-1905	399	35	8.77
Season of 1905-1906	437	33	7.55

In a number of cases the deficiency is small, only 3.43 per cent. being as much or more than 3.00 per cent. below the manufacturer's guaranteed value. Here again we note an improvement as compared

with 1904-1905, when 5.26 per cent. of all samples anaylzed were as much as 3.00 per cent. below the guaranteed value. The guarantee is printed on every bag of fertilizer and these analyses make it appear that farmers may quite generally feel assured that they will receive in their fertilizers the plant food claimed for them.

Uniformity.—It need hardly be repeated here that it is entirely impracticable to maintain an absolute uniformity of composition in any brand of fertilizer. Raw materials of invariable composition are not always to be had, and those who are engaged in the manufacture of fertilizers are forced to make a safe allowance for the variable composition of some of the materials used. It is possible to hold these variations within reasonable limits, and to preserve the specific character of any brand.

Complete fertilizers.—In past years there has been a tendency on the part of a few purchasers to practice a kind of false economy by buying a low grade mixture. It is certainly safe to say that this procedure is unwise. **If a complete fertilizer is desired, it should contain at least 1.65 to 2.00 per cent. of nitrogen and not less than the same percentage of potash. It is better to buy an acid phosphate at once than to purchase mixtures containing only a comparatively small amount of nitrogen and potash.**

Table I.—This table will give a general idea of the results of the work on the goods sold by the various manufacturers. The general summary here is also compared with that for season of 1904-1905. There is an improvement in almost every case.

Table II.—All analyses for the season are to be found in this table. The analytical work is distributed with a view of giving the more important brands of each manufacturer the attention which the sales of these demand. The small number of brands in this State enables the Department to make a large number of analyses of samples of some of them, and the system of inspection is thereby somewhat simplified and rendered much more satisfactory and efficient than would be possible with the large number of brand names found on sale in some states.

Table III.—The analyses of manufacturer's samples, together with the guarantees, appear in this table. All brands registered for sale during 1905-1906 are given.

Schedule of Valuations. — All relative commercial values appearing in this bulletin are calculated by use of the following values:

	per lb.	per unit.
For Nitrogen	20c	$4.00
For Water-Soluble Phosphoric Acid in mixed goods	6c	1.20
For Citrate Soluble Phosphoric Acid in mixed goods	5½c	1.10
For Water Soluble Phosphoric Acid in plain Acid Phosphate	5½c	1.10
For Citrate-Soluble Phosphoric Acid in plain Acid Phosphate	5c	1.00
For Total Phosphoric Acid in fine bone	3c	.60
For Total Phosphoric Acid in medium and coarse bone	2½c	.50
For Potash	5c	1.00

TABLE I—SUMMARY OF RESULTS IN TABLE II.

Name and Address of Manufacturer.	Number of Samples Analyzed.	Number of Samples equal to or above guarantee in Available Phosphoric Acid, Nitrogen, and Potash.	Number of Samples found as much as five per cent. below guarantee in available Phosphoric Acid.	Number of Samples found as much as eight per cent. below guarantee in Nitrogen.	Number of Samples found as much as eight per cent. below guarantee in Potash.	Number of Samples found as much as three per cent. below guarantee in Relative Commercial Value.	Number of Samples found to be equal to or above guarantee in Relative Commercial Value.
Alabama Chemical Company, Montgomery, Ala.	2	0	1	1	0	0	2
American Guano Company, Nashville, Tenn.	2	0	1	1	0	1	0
Armour Fertilizer Works, Atlanta, Ga.	4	3	0	1	1	0	4
Birmingham Fertilizer Company, Birmingham, Ala.	14	5	1	5	0	1	13
Brookhaven Progressive Cotton Oil Co., Brookhaven, Miss.	3	0	0	1	0	0	3
Canton Oil Mill Company, Canton, Miss.	3	3	0	0	0	0	3
Capital Fertilizer and M'f'g Co., Jackson, Miss.	17	8	0	2	2	0	17
Crystal Springs Oil Mill, Fertilizer and M'f'g Co., Crystal Springs, Miss.	8	4	1	1	0	0	8
Eagle Cotton Oil Co., Meridian, Miss.	4	2	2	0	0	0	2
Federal Chemical Company, Louisville, Ky.	5	3	0	0	0	0	5
Gulfport Cotton Oil, Fert., & M'f'g Co., Gulfport, Miss.	21	18	0	1	0	0	21
Hazlehurst Oil Mill and Fertilizer Co., Hazlehurst, Miss.	10	9	0	0	0	0	10
Jackson Fertilizer Company, Jackson, Miss.	43	16	0	6	3	1	40
Jefferson Gin and Oil Mill, Harriston, Miss.	2	1	0	0	0	0	2
Kosciusko Oil Mill and Fertilizer Co., Kosciusko, Miss.	9	4	0	3	0	0	9
Laurel Oil and Fertilizer Co., Laurel, Miss.	17	11	0	0	0	0	17
Marbach and Eagan, Crystal Springs, Miss.	2	0	0	2	0	1	0

P. B. Mathison M'f'g Co., St. Louis, Mo.	1	0	0	0	0	0	1
Meridian Fertilizer Factory, Meridian, Miss.	91	60	1	12	0	2	87
New Orleans Acid and Fertilizer Co., New Orleans, La.	14	11	0	2	1	0	13
Newton Oil and M'f'g Co., Newton, Miss.	13	6	3	3	0	2	11
Planters Fertilizer and Chemical Co., New Orleans, La.	7	3	0	2	0	0	7
Refuge Cotton Oil Company, Columbus, Miss.	8	5	0	3	0	0	8
Shubuta Oil and M'f'g Co., Shubuta, Miss.	3	0	0	0	0	0	3
Southern Oil and Fertilizer Co., Meridian, Miss.	10	5	1	3	1	1	8
Standard Guano and Chemical M'f'g Co., New Orleans, La.	43	27	2	2	2	2	39
Swift Fertilizer Works, Atlanta, Ga.	7	5	0	1	0	0	6
Tennessee Chemical Company, Nashville, Tenn.	2	1	0	1	0	0	2
Tennessee Valley Fertilizer Co., Florence, Ala.	3	0	0	3	0	0	2
Threefoot Bros. & Co., Meridian, Miss.	6	4	0	0	2	0	6
Tupelo Fertilizer Factory, Tupelo, Miss.	15	10	0	3	0	0	15
Virginia Carolina Chemical Co., Memphis, Tenn.	45	22	3	7	1	4	37
Wesson Cotton Oil & Fert. Co., Wesson, Miss.	3	0	0	0	2	0	3
Totals	437	246	16	66	15	15	404
Percentages		56.29	3.66	15.10	3.43	3.43	92.45
Totals for season 1904.1905	399	214	26	65	5	21	364
Percentages for Season 1904.1905		53.63	6.51	16.29	1.25	5.26	91.23

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	ALABAMA CHEMICAL CO., Montgomery, Ala.	
5587	S. G. Success Mixture	A. W. Allen, Tupelo
5588	S. G. Success Mixture	Williams, Hines & Co., Ripley
		Average
		Guarantee
	AMERICAN GUANO CO., Nashville, Tenn.	
5312	S.G.Mule Brand Blood and Bone	McKinney Grocery Co., Iuka
		Guarantee
5128	S.G.Bourland's Cot .Grower	W. L. Bourland, Amory
		Guarantee
	ARMOUR FERTILIZER WORKS, Atlanta, Ga.	
5589	Shield Brand Armour's H. G. Superphosphate	Noah Bros., Baldwyn
		Guarantee
5284	Shield Brand Armour's S. G. Superphosphate	T. S. Turner, Canton
		Guarantee
5285	Shield Brand S. G. King Cot	T. S. Turner, Canton
5590	Shield Brand S. G. King Cot	W. L. Bourland, Amory
		Average
		Guarantee
	BIRMINGHAM FERT'IZER CO., Birmingham, Ala.	
5591	Monarch H. G. Acid Phos.	Madison Merc. Co., Madison
5592	Monarch H. G. Acid Phos.	J. A. Taylor & Son, Pelahatchie
		Average
		Guarantee
5427	B'ham H. G. Fertilizer	J. A. Lowe & Co., Nettleton
		Guarantee
5593	B'ham S. G. Fertilizer	Gilmore & May Co., Amory
5594	B'ham S. G. Fertilizer	Gilmore & May Co., Amory
		Average
		Guarantee
5212	S. G. Monarch Meal Mixture	Howie Bros., Morton
5428	S. G. Monarch Meal Mixture	Hudson & Co., Sumrall
5595	S. G. Monarch Meal Mixture	Gaddis & Slay, Magee
5596	S. G. Monarch Meal Mixture	Thomas Gale, Jackson
5597	S. G. Monarch Meal Mixture	Hyman Merc. Co., Summit
5598	S. G. Monarch Meal Mixture	J. S. Eaton & Bro., Taylorsville
5599	S. G. Monarch Meal Mixture	Florence Merc. Co., Florence
5600	S. G. Monarch Meal Mixture	Brandon Merc. Co., Brandon
5601	S. G. Monarch Meal Mixture	Hitt, Hart & Blackstone, Winona
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5587	10.50	7.04	4.21	11.25	.19	1.39	2.78	$21 42
5588	7.87	5.90	3.04	8.94	.64	1.67	2.91	20 01
	9.18	**6.47**	**3.62**	**10.09**	**.41**	**1.53**	**2.85**	**20 72**
		8.00	*1.50*	*9.50*	*2.00*	*1.65*	*1.50*	*19 35*
5312	6.50	4.64	3.74	8.38	2.79	1.53	1.75	17 55
		6.00	*3.00*	*9.00*	*2.00*	*1.65*	*1.00*	*18 10*
5128	9.83	5.68	2.27	7.95	2.05	1.38	3.82	18 65
		5.50	*2.50*	*8.00*	*1.00*	*1.65*	*3.00*	*18 95*
5589	9.04	10.64	4.88	15.52	1.20			16 58
		10.00	*4.00*	*14.00*	*1.00*			*15 00*
5284	7.70	9.07	3.55	12.62	1.82			13 53
		10.00	*2.00*	*12.00*	*1.00*			*13 00*
5285	9.95	6.83	3.85	10.68	2.37	1.44	1.80	19 99
5590	8.07	5.49	3.47	8.96	1.74	1.68	2.90	20 03
	9.01	**6.16**	**3.66**	**9.82**	**2.05**	**1.56**	**2.35**	**20 01**
		6.00	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*18 00*
5591	8.37	9.20	5.95	15.15	.32			16 07
5592	9.25	9.11	5.72	14.83	.31			15 74
	8.81	**9.15**	**5.84**	**14.99**	**.31**			**15 91**
		12.00	*2.00*	*14.00*	*2.00*			*15 20*
5427	12.35	6.83	1.98	8.81	1.56	1.78	2.01	19 50
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*20 40*
5593	8.20	6.56	2.99	9.55	.93	1.70	2.57	20 53
5594	10.41	6.51	3.19	9.70	1.24	1.43	2.61	19 65
[illegible]	**9.30**	**6.53**	**3.09**	**9.62**	**1.08**	**1.57**	**2.59**	**20 09**
		6.00	*2.00*	*8.00*	*2.00*	*1.65*	*2.00*	*18 00*
5212	13.00	8.79	2.06	10.85	1.59	1.35	2.06	20 27
5428	11.33	8.19	3.07	11.26	.79	1.55	1.77	21 18
5595	11.00	8.47	2.77	11.24	.99	1.46	2.13	21 18
5596	10.60	7.62	3.96	11.58	.15	1.73	2.72	23 14
5597	10.25	7.79	3.95	11.74	.61	1.40	2.55	21 84
5598	11.91	7.69	2.74	10.43	1.15	1.42	2.67	20 59
5599	10.82	7.75	2.76	10.51	1.04	1.68	2.85	21 91
5600	11.52	7.59	2.82	10.41	1.18	1.64	1.74	20 51
5601	12.00	6.92	3.81	10.73	.46	1.72	1.74	21 12
	11.38	**7.87**	**3.10**	**10.97**	**.88**	**1.55**	**2.25**	**21 30**
		7.50	*2.00*	*9.50*	*2.00*	*1.65*	*1.50*	*19 30*

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	BROOKHAVEN PROGRESSIVE COTTON OIL CO., Brookhaven, Miss.	
5129	B'haven H. G. Special Mix.	Louis Cohn & Bros., Brookhaven
		Guarantee
5562	S. G. New South	A. C. Seavey & Sons, Brookhaven
5563	S. G. New South	John McGrath & Sons, Brookhaven
		Average
		Guarantee
	CANTON OIL MILL COMPANY, Canton, Miss.	
5446	H. G. Acid Phosphate	W. H. Coulter, Canton
		Guarantee
5447	S. G. Madison	W. H. Coulter, Canton
		Guarantee
5448	S. G. Paragon	W. H. Coulter, Canton
		Guarantee
	CAPITAL FERT. & M'F'G. CO., Jackson, Miss.	
5130	S. G. Acid Phosphate	J. D. Ray, Kosciusko
5603	S. G. Acid Phosphate	Moore Bros., Morton
5604	S. G. Acid Phosphate	Mississippi Cotton Oil Co., Grenada
		Average
		Guarantee
5313	S. G. Cotton Elevator	J. D. Ray, Kosciusko
		Guarantee
5075	S. G. Nonpariel	W. C. Ellis Merc. Co., New Hebron
5131	S. G. Nonpariel	J. D. Ray, Kosciusko
5286	S. G. Nonpariel	W. E. Payne, Merc. Co. Collins
5314	S. G. Nonpariel	J. L. Moyse & Bro., Summit
5315	S. G. Nonpariel	M. E. Berry, Pinola
5605	S. G. Nonpariel	D'Lo Merc. Co., D'Lo
5606	S. G. Nonpariel	McComb City Merc. Co., McComb City
5607	S. G. Nonpariel	C. L. Cross & Co., Enterprise
		Average
		Guarantee
5076	S. G. Red Star Brand	Capital Fert. & M'f'g. Co., Jackson
5132	S. G. Red Star Brand	J. D. Ray, Kosciusko
5429	S. G. Red Star Brand	L. H. Ginn, Mesa
5608	S. G. Red Star Brand	A. E. Jennings & Co., Water Valley
		Average
		Guarantee
5316	S. G. German Kainit	J. D. Ray, Kosciusko
		Guarantee
	CRYSTAL SP'GS OIL MILL, F'RT & MFG. CO., Crystal Sp'gs, Miss.	
5287	S. G. Crystal Star	Lotterhos & Huber, Crystal Springs
5609	S. G. Crystal Star	Alford & Miller, Gallman
5610	S. G. Crystal Star	Lotterhos & Huber, Crystal Springs
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5129	10.16	7.23	4.22	11.45	.58	1.50	2.15	$21.47
		7.00	*3.00*	*10.00*	*1.00*	*1.65*	*2.00*	*20.30*
5562	9.70	6.17	1.77	7.94	.50	1.64	2.27	18.18
5563	11.78	6.43	2.40	8.83	.20	1.49	2.15	18.47
	10.74	**6.30**	**2.08**	**8.38**	**.35**	**1.57**	**2.21**	**18.33**
		5.50	*2.50*	*8.00*	*1.00*	*1.65*	*2.00*	*17.95*
5446	14.47	11.26	3.78	15.04	1.53			16.17
		11.00	*4.00*	*15.00*	*1.00*			*16.10*
5447	14.65	9.57	2.59	12.16	1.43		2.11	16.44
		9.50	*2.50*	*12.00*	*1.00*		*2.00*	*16.15*
5448	11.77	6.01	3.43	9.44	.99	2.12	2.00	21.47
		6.00	*2.50*	*8.50*	*1.50*	*2.06*	*2.00*	*20.19*
5130	9.43	11.74	3.24	14.98	.36			16.15
5603	8.50	9.83	4.04	13.87	.28			14.85
5604	10.37	9.27	5.04	14.31	.22			15.24
	9.43	**10.28**	**4.11**	**14.39**	**.29**			**15.42**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
5313	5.65	6.61	2.87	9.48	.36	1.55	2.60	19.89
		6.50	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*18.05*
5075	8.50	7.36	3.36	10.72	.27	1.58	2.33	21 18
5131	9.80	6.91	3.50	10.41	.24	1.60	2.23	20 77
5286	9.48	6.87	3.02	9.89	.31	1.70	2.07	20.44
5314	5.64	7.11	2.98	10.09	.31	1.62	2.29	20.58
5315	8.40	7.56	3.16	10.72	.26	1.51	2.61	21.20
5605	9.61	6.36	3.39	9.75	.27	1.72	2.18	20 42
5606	11.15	6.68	3.11	9.79	.51	1.73	1.91	20.27
5607	10.54	6.06	3.19	9.25	.15	2.10	2.00	21.18
	9.14	**6.86**	**3.21**	**10.07**	**.29**	**1.70**	**2.20**	**20.76**
		6.50	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*18.05*
5076	8.55	7.75	2.84	10.59	.27	1.59	1.68	20 46
5132	9.99	7.09	2.84	9.93	.35	1.48	2.42	19.97
5429	8.70	6.69	2.64	9.33	.20	1.88	2.22	20.67
5608	9.90	7.45	2.25	9.70	.13	1.98	1.79	21.13
	9.29	**7.25**	**2.64**	**9.89**	**.24**	**1.73**	**2.04**	**20 56**
		6.50	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*18.05*
5316	1.75						12.00	12 00
							12.00	*12.00*
5287	9.60	4.80	2.97	7.77	.27	2.04	4.50	21.69
5609	11.05	6.17	2.69	8.86	.46	1.76	2.99	20.39
5610	10.92	6.04	2.60	8.64	.79	1.70	3.17	20.08
	10.52	**5.67**	**2.76**	**8.43**	**.51**	**1.83**	**3.56**	**20.72**
		6.50	*2.50*	*9.00*	*1.00*	*1.70*	*1.90*	*19.25*

Laboratory Number	Name of Brand and Manufacturer.	Where and from Whom Collected.
5288	S. G. L.&H.'s Cotton Fert.	Lotterhos & Huber, Crystal Springs
5611	S. G. L.&H.'s Cotton Fert.	Lotterhos & Huber, Crystal Springs
5612	S. G. L.&H.'s Cotton Fert.	Lotterhos & Huber, Crystal Springs
		Average
		Guarantee
5613	H.G.L.& H.'s Vegetable Fert.	Lotterhos & Huber, Crystal Springs
		Guarantee
5614	S. G. German Kainit	Lotterhos & Huber, Crystal Springs
		Guarantee
	EAGLE COTTON OIL COMPANY, Meridian, Miss.	
5213	H. G. Eagle Acid Phosphate	W. H. Joyner, Forest
5615	H. G. Eagle Acid Phosphate	C. T. Bonner, Enterprise
		Average
		Guarantee
5214	S. G. Farm Mixture	W. H. Joyner, Forest
5317	S. G. Farm Mixture	Buffkin & Davis, Waynesboro
		Average
		Guarantee
	FEDERAL CHEMICAL CO., Louisville, Ky. MARKS & GAYLE, Div. M'grs., Montgomery, Ala.	
5430	Daybreak Pure H. G. Acid Phosphate	R. T. Rutledge, Iuka
5616	Daybreak Pure H. G. Acid Phosphate	McLain & Ratcliff, Gloster
		Average
		Guarantee
5431	S. G. Daybreak Fertilizer	J. A. Goree, Columbus
5617	S. G. Daybreak Fertilizer	Smythe, Gaddis & Co., Forest
5618	S. G. Daybreak Fertilizer	Winona Hardware Co., Winona
		Average
		Guarantee
	GULFPORT COTTON OIL, FERT. & M'F'G. CO., Gulfport, Miss.	
5220	Primo H. G. Acid Phosphate	Gulfport Cotton Oil, Fert. & M'f'g. Co., Columbia
5619	Primo H. G. Acid Phosphate	D. J. Richey, Enterprise
		Average
		Guarantee
5620	Primo S. G. Acid Phosphate	Donald Bros. Co., Magee
5621	Primo S. G. Acid Phosphate	J. P. Myer, Ellisville
		Average
		Guarantee
5221	Primo H. G. Blood & Bone	The Lampton Co., Columbia
5622	Primo H. G. Blood & Bone	J. H. South, Florence
5623	Primo H. G. Blood & Bone	Holmes Bros., McComb City
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5288	10.38	6.13	3.13	9.26	.18	1.97	2.61	$21.29
5611	10.96	6.06	2.50	8.56	.70	1.81	3.29	20.55
5612	10.75	6.05	2.34	8.39	.88	1.77	3.22	20.13
	10.70	**6.08**	**2.66**	**8.74**	**.59**	**1.85**	**3.04**	**20.66**
		6.50	*1.50*	*8.00*	*1.00*	*1.75*	*2.00*	*18.45*
5613	9.45	4.89	2.57	7.46	.58	2.67	5.27	24.65
		4.00	*1.00*	*5.00*	*1.00*	*3.00*	*5.00*	*22.90*
5614	2.55						12.00	12.00
							12.00	*12.00*
5213	13.78	9.39	4.26	13.65	1.62			14.59
5615	13.32	8.98	4.73	13.71	1.16			14.61
	13.55	**9.19**	**4.49**	**13.68**	**1.39**			**14.60**
		10.00	*4.00*	*14.00*	*1.00*			*15.00*
5214	10.78	5.78	3.38	9.16	1.23	1.78	3.11	20.88
5317	7.99	5.77	3.48	9.25	1.37	1.86	2.52	20.71
	9.38	**5.78**	**3.43**	**9.21**	**1.30**	**1.82**	**2.82**	**20.80**
		6.00	*2.00*	*8.00*		*1.65*	*2.00*	*18.00*
5430	11.05	12.65	3.19	15.84	1.43			17.11
5616	10.48	10.85	5.51	16.36	1.02			17.45
	10.77	**11.75**	**4.35**	**16.10**	**1.12**			**17.28**
		10.00	*4.00*	*14.00*	*1.00*			*15.00*
5431	8.05	6.67	2.52	9.19	6.01	1.61	2.34	19.56
5617	8.05	5.67	3.75	9.42	4.38	1.67	2.02	19.63
5618	7.63	5.99	3.24	9.23	1.60	1.64	1.89	19.20
	7.91	**6.11**	**3.17**	**9.28**	**4.00**	**1.64**	**2.08**	**19.46**
		5.33	*2.67*	*8.00*	*1.00*	*1.65*	*2.00*	*17.93*
5220	12.04	12.73	3.24	15.97	1.77			17.24
5619	9.18	10.59	5.29	15.88	.45			16.94
	10.61	**11.66**	**4.27**	**15.93**	**1.11**			**17.09**
		12.00	*2.00*	*14.00*	*1.00*			*15.20*
5620	10.25	10.66	5.82	16.48	1.18			17.55
5621	7.76	8.98	5.48	14.46	1.11			15.36
	9.01	**9.82**	**5.65**	**15.47**	**1.14**			**16.45**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
5221	10.37	8.21	3.29	11.50	2.81	1.62	3.50	23.45
5622	8.81	7.71	2.41	10.12	1.02	2.20	2.01	22.71
5623	8.25	6.82	4.07	10.89	2.23	2.35	2.60	24.66
	9.14	**7.58**	**3.25**	**10.83**	**2.02**	**2.06**	**2.70**	**23.61**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*20.40*

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
5289	Primo S. G. Cotton & Corn	J. S. Eaton & Bro., Taylorsville
5624	Primo S. G. Cotton & Corn	J. H. Thompson & Bro., Grange
		Average
		Guarantee
5222	Primo S. G. Cottonseed Meal Compound	Gulfport Cotton Oil, Fert & M'f'g. Co., Columbia
5223	Primo S. G. Cottonseed Meal Compound	Abbey & Travis, Heidelberg
5625	Primo S. G. Cottonseed Meal Compound	Mendenhall Merc Co., Mendenhall
5626	Primo S. G. Cottonseed Meal Compound	J. B. Triplett, McCool
5627	Primo S. G. Cottonseed Meal Compound	T. S. Turner, Canton
		Average
		Guarantee
5318	Primo H. G. Cottonseed Meal Mixture	Louis Cohn & Bros., Brookhaven
5628	Primo H. G. Cottonseed Meal Mixture	Louis Cohn & Bros., Brookhaven
5629	Primo H. G. Cottonseed Meal Mixture	Donald Bros., Magee
		Average
		Guarantee
5225	Primo S. G. R. B. Superphos.	The Lampton Co., Columbia
5630	Primo S. G. R. B. Superphos.	J. L. Moyse & Bro., Summit
		Average
		Guarantee
5224	Primo H.G. Raw Ground Bone	Gulfport Cotton Oil, Fert. & M'f'g. Co., Columbia
5631	Primo H. G. Raw Ground Bone	Holmes Bros., McComb City
		Average
		Guarantee
	Hazlehurst Oil Mill & Fert. Co., Hazlehurst, Miss.	
5290	H. G. Acid Phosphate	Hazlehurst Oil Mill & Fert.Co., H'hurst
5632	H. G. Acid Phosphate	C. F. Nelson & Son, Goodman
		Average
		Guarantee
5291	S. G. Imperial Fertilizer	H'hurst Oil Mill & Fert. Co., Hazlehurst
5292	S. G. Imperial Fertilizer	J. R. Gallaspy, Crystal Springs
5633	S. G. Imperial Fertilizer	W. L. Robinson Co., Liberty
5634	S. G. Imperial Fertilizer	Parsons, May, Oberschmidt Co., Brookhaven
5635	S. G. Imperial Fertilizer	Grenada Oil Mill, Grenada
5636	S. G. Imperial Fertilizer	J. R. Gallaspy, Crystal Springs
5637	S. G. Imperial Fertilizer	C. F. Nelson & Son, Goodman
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5289	7.78	6.66	3.17	9.77	2.56	1.59	2.43	$20.20
5624	6.56	5.68	3.79	9.47	2.51	1.66	2.32	19.95
	7.17	**6.14**	**3.48**	**9.62**	**2.53**	**1.63**	**2.37**	**20.08**
		6.00	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*18.00*
5222	9.83	6.88	2.42	9.30	1.29	1.77	3.17	21.17
5223	9.59	6.81	2.46	9.27	1.15	1.90	3.03	21.51
5625	8.40	7.39	2.75	10.14	1.04	1.91	2.45	21.98
5626	9.77	6.52	2.14	8.66	.99	1.94	2.60	20.54
5627	9.60	6.59	2.31	8.90	.99	1.84	2.63	20.44
	9.44	**6.84**	**2.42**	**9.26**	**1.09**	**1.87**	**2.78**	**21.13**
		6.00	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*18.00*
5318	7.61	8.72	3.70	12.42	1.34	1.68	2.88	24.13
5628	10.30	7.57	3.35	10.92	.54	1.89	2.73	23.06
5629	9.93	7.62	2.72	10.34	.96	1.84	2.47	21.97
	9.28	**7.97**	**3.26**	**11.23**	**.95**	**1.80**	**2.70**	**23.05**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*20.40*
5225	8.15	6.69	3.20	9.89	2.47	1.52	2.73	20.36
5630	11.87	5.99	2.43	8.42	1.10	1.85	2.84	20.10
	10.01	**6.34**	**2.81**	**9.15**	**1.78**	**1.69**	**2.78**	**20.23**
		6.00	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*18.00*
5224	4.13				24.74	3.25		25.37
5631	18.35				23.80	3.18		24.62
	11.24				**24.27**	**3.22**		**25.00**
					20.00	*3.00*		*22.00*
5290	10.43	12.23	4.88	17.11	1.66			18.33
5632	9.20	10.11	6.67	16.78	1.22			17.79
	9.82	**11.17**	**5.78**	**16.95**	**1.44**			**18.06**
		12.00	*2.00*	*14.00*	*1.00*			*15.20*
5291	10.45	7.48	2.94	10.42	1.25	1.89	2.08	21.85
5292	11.03	7.70	3.17	10.87	1.30	1.70	1.95	21.48
5633	10.47	7.41	3.16	10.57	1.25	1.83	1.88	21.57
5634	9.67	7.51	2.98	10.49	.99	1.67	2.41	21.38
5635	10.99	7.28	3.16	10.44	1.06	1.72	2.36	21.45
5636	9.59	7.79	3.26	11.05	1.02	1.57	2.29	21.50
5637	11.41	7.29	3.11	10.40	1.18	1.76	2.26	21.47
	10.52	**7.50**	**3.11**	**10.61**	**1.15**	**1.73**	**2.18**	**21.52**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.75*	*19.55*

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
5293	S. G. German Kainit	H'hurst Oil Mill&Fert. Co., Hazlehurst
		Guarantee
	JACKSON FERTILIZER CO., Jackson, Miss.	
5176	H. G. Acid Phosphate	Gaddis & Slay Co., Magee
5215	H. G. Acid Phosphate	T. B. Gaddis, Morton
5638	H. G. Acid Phosphate	Centreville Merc. Co., Centreville
5639	H. G. Acid Phosphate	Mullen & Owen Co., Durant
5640	H. G. Acid Phosphate	S. H. Andrews, Enterprise
5641	H. G. Acid Phosphate	Johnson-Woodward Co., Mt. Olive
		Average
		Guarantee
5319	S.G.Black Hawk Acid Phos.	G. M. Gallaspy, Decatur
5642	S.G.Black Hawk Acid Phos.	W. L. Robinson Co., Liberty
		Average
		Guarantee
5226	H. G. Bone Meal	The Lampton Co., Columbia
		Guarantee
5643	S. G. Chicago R. B. Superphosphate	T. W. Pylant Bros. & Co., Purvis
5644	S. G. Chicago R. B. Superphosphate	Moreton, Wentworth Co., Brookhaven
5645	S. G. Chicago R. B. Superphosphate	I. N. Varnado Son's Co., Osyka
		Average
		Guarantee
5294	S. G. Lampton's Am. R. B. Superphosphate	Lotterhos & Huber, Crystal Springs
5320	S. G. Lampton's Am. R. B. Superphosphate	Lampton Merc. Co., Magnolia
5462	S. G. Lampton's Am. R. B. Superphosphate	Lotterhos & Huber, Crystal Springs
5646	S. G. Lampton's Am. R. B. Superphosphate	The Lampton & Rawls Co., Mt. Olive
5647	S. G. Lampton's Am. R. B. Superphosphate	The Lampton Co., Columbia
		Average
		Guarantee
5295	H. G. L. & H.'s Special Fert.	Lotterhos & Huber, Crystal Springs
5463	H. G. L. & H.'s Special Fert.	Lotterhos & Huber, Crystal Springs
5648	H. G. L. & H.'s Special Fert.	Lotterhos & Huber, Crystal Springs
		Average
		Guarantee
5077	S. G. Royal "C" Brand	Story & Company, Forest
5177	S. G. Royal "C" Brand	F. N. & C. T. Taylor, Magee
5178	S. G. Royal "C" Brand	Gaddis & Slay Co., Magee
5216	S. G. Royal "C" Brand	T. B. Gaddis, Morton
5227	S. G. Royal "C" Brand	The Lampton Co., Columbia
5296	S. G. Royal "C" Brand	Lampton & Rawls Co., Mt. Olive
5297	S. G. Royal "C" Brand	J. P. Myer Merc. Co., Taylorsville
5298	S. G. Royal "C" Brand	T. S. Turner, Canton

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5293	1.88						12.32	$12 32
							12.00	*12 00*
5176	9.20	11.51	2.81	14.32	5.62			15 47
5215	11.35	11.59	3.10	14.69	5.07			15 85
5638	12.25	11.36	6.35	17.71	.43			18 85
5639	9.30	10.04	6.20	16.24	3.89			17 24
5640	9.46	7.71	6.52	14.23	5.44			15 00
5641	11.11	12.11	5.18	17.29	.93			18 50
	10.45	**10.72**	**5.03**	**15.75**	**3.56**			**16 82**
		12.00	*2.00*	*14.00*	*1.00*			*15 20*
5319	8.14	12.54	2.80	15.34	.65			16 59
5642	10.03	10.71	3.56	14.27	.79			15 34
	9.09	**11.63**	**3.18**	**14.81**	**.72**			**15 97**
		10.00	*2.00*	*12.00*	*1.00*			*13 00*
5226	6.75				21.86	3.02		23.01
					22.90	*2.47*		*21.33*
5643	9.90	5.85	4.04	*9.89	2.43	1.57	1.16	18 90
5644	9.02	6.06	4.00	10.06	2.34	1.47	1.53	19.08
5645	9.76	6.72	3.81	10.53	2.01	1.47	1.73	19.87
	9.56	**6.21**	**3.95**	**10.16**	**2.26**	**1.50**	**1.48**	**19 28**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.50*	*19.30*
5294	10.43	7.70	1.92	9.62	.65	3.86	2 10	28 89
5320	8.65	6.74	4.07	10.81	1.80	1.59	2.03	20.96
5462	11.37	7.13	2.42	9.55	.81	3.89	1.77	28.55
5646	9.17	6.40	4.14	10.54	2.02	1.60	1 54	20.17
5647	9.12	6.46	4.25	10.71	2.01	1.66	1.50	20 57
	9.75	**6.89**	**3.36**	**10.25**	**1.66**	**2.52**	**1 79**	**23 83**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.50*	*19.30*
5295	9.85	6.69	2.01	8.70	.87	1.91	4.62	22.50
5463	11.30	6.17	1.96	8.13	.83	1.88	5.15	22.23
5648	9.63	4.89	3.45	8.34	4.87	1.96	4.03	21.53
	10.26	**5.92**	**2.47**	**8.39**	**2.19**	**1.92**	**4.60**	**22.10**
		6.00	*2.00*	*8.00*	*1.00*	*2.40*	*3.40*	*22.40*
5077	10.02	9.08	3.01	12.09	.74	1.71	1.97	23.02
5177	10.20	7.29	3.49	10.78	1.14	1.76	2.56	22.19
5178	10.13	8.81	2.84	11.65	1.57	1.62	2.05	22.23
5216	11.40	9.19	2.48	11.67	1.29	1.58	2.35	22.43
5227	10.65	9.06	2.82	11.88	1.11	1.40	2.45	22.02
5296	11.52	8.05	2.50	10.55	3.91	1.71	1.84	21.09
5297	11.28	8.64	2.41	11.05	2.67	1.62	2.04	21.54
5298	12.99	8.20	2.56	10.76	1.20	1.63	2.20	21.38

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
5321	S. G. Royal "C" Brand	Barney & Johns Co., Gloster
5322	S. G. Royal "C" Brand	Centreville Merc. Co., Centreville
5323	S. G. Royal "C" Brand	Walker-Durr Co., Pinola
5464	S. G. Royal "C" Brand	Lotterhos & Huber, Crystal Springs
5649	S. G. Royal "C" Brand	I. N. Varnado Son's Co., Osyka
5650	S. G. Royal "C" Brand	Holmes Bros., McComb City
5651	S. G. Royal "C" Brand	James & Lawson, Mendenhall
5652	S. G. Royal "C" Brand	Seward & Co., Ackerman
5653	S. G. Royal "C" Brand	G. W. Armstrong, Coffeeville
5654	S. G. Royal "C" Brand	Blackstone Merc. Co., Winona
5655	S. G. Royal "C" Brand	S. Bernheimer & Sons, Port Gibson
5656	S. G. Royal "C" Brand	Rankin County State Farm, Greenfield
5657	S. G. Royal "C" Brand	A. C. Seavey & Sons, Brookhaven
5658	S. G. Royal "C" Brand	Dunagin & Whitaker, Laurel
5659	S. G. Royal "C" Brand	T. M. Heidelberg, Heidelberg
		Average
		Guarantee
	Jefferson Gin & Oil Mill, Harriston, Miss.	
5660	S. G. Jefferson Fertilizer	Jefferson Gin & Oil Mill, Harriston
		Guarantee
5661	H. G. Fortuna Fertilizer	Jefferson Gin & Oil Mill, Harriston
		Guarantee
	Kosciusko Oil Mill & Fert. Company. Kosciusko, Miss.	
5133	H. G. Acid Phosphate	Kelly & Wood, Kosciusko
5179	H. G. Acid Phosphate	J. B. Triplett, McCool
5662	H. G. Acid Phosphate	Seward & Fancher, Noxapater
		Average
		Guarantee
5134	S. G. Peerless Guano	W. B. Potts & Sons, Kosciusko
5135	S. G. Peerless Guano	G. Lowenberg & Co., Kosciusko
5136	S. G. Peerless Guano	Kosciusko Oil Mill & Fert.Co., K'sko
5180	S. G. Peerless Guano	J. B. Triplett, McCool
5663	S. G. Peerless Guano	Bennett Bros. & McMillin, Louisville
5664	S. G. Peerless Guano	Seward & Fancher, Noxapater
		Average
		Guarantee
	Laurel Oil & Fert. Co., Laurel, Miss.	
5078	S. G. Acid Phosphate	Laurel Oil & Fert. Co., Laurel
5181	S. G. Acid Phosphate	The W. C. Ellis Co., Magee
5324	S. G. Acid Phosphate	Snowden Bros., Union
5665	S. G. Acid Phosphate	Williams & Freeman, Sandersville
		Average
		Guarantee
5228	S. G. K. C. Ammoniated Bone	W. W. Pigford, Lumberton
5666	S. G. K. C. Ammoniated Bone	E. E. Bonner, Sandersville

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5321	8.55	7.83	2.78	10.61	3.84	1.63	1.93	$20.90
5322	10.44	8.07	2.44	10.51	3.33	1.67	1.79	20.84
5323	9.85	8.53	2.36	10.89	3.89	1.59	2.11	21.30
5464	11.47	7.54	2.18	9.72	2.12	1.76	2.61	21.10
5649	9.80	6.78	3.53	10.31	3.43	1.73	1.57	20.51
5650	8.72	6.52	3.26	9.78	4.02	1.69	1.93	20.10
5651	10.44	6.92	3.46	10.38	3.49	1.61	1.81	20.36
5652	9.68	6.40	4.17	10.57	3.54	1.67	1.72	20.67
5653	10.66	6.78	3.86	10.64	3.07	1.67	1.76	20.82
5654	10.27	6.65	3.49	10.14	3.74	1.66	1.65	20.11
5655	11.37	8.34	3.32	11.66	1.98	1.63	1.75	21.93
5656	11.28	7.97	2.92	10.89	2.88	1.73	1.49	21.19
5657	11.40	7.75	2.49	10.24	2.89	1.63	1.69	20.25
5658	11.40	7.30	2.89	10.19	2.10	1.78	1.68	20.74
5659	13.62	8.71	3.43	12.14	.73	1.62	1.69	22.40
	10.75	**7.84**	**2.99**	**10.83**	**2.55**	**1.66**	**1.94**	**21.27**
		7.50	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*19.60*
5660	11.55	6.61	3.85	10.46	.60	1.64	1.79	20.52
		6.75	*2.25*	*9.00*	*.55*	*1.65*	*1.75*	*18.93*
5661	5.40	8.06	3.88	11.94	1.32	2.52		24.02
		8.00	*2.00*	*10.00*	*.80*	*2.45*		*21.60*
5133	10.27	10.85	4.28	15.13	2.43			16.22
5179	11.79	13.25	4.00	17.25	1.43			18.58
5662	8.92	12.04	5.21	17.25	1.14			18.45
	10.33	**12.05**	**4.49**	**16.54**	**1.67**			**17.75**
		11.00	*3.00*	*14.00*	*1.00*			*15.10*
5134	9.61	7.68	3.67	11.35	1.39	1.56	2.23	21.72
5135	8.67	7.94	3.70	11.64	.83	1.74	2.28	22.84
5136	9.51	8.24	4.12	12.36	.45	1.53	2.18	22.72
5180	10.98	9.44	3.06	12.50	1.16	1.50	2.06	22.75
5663	11.26	7.91	3.59	11.50	.96	1.66	1.75	21.83
5664	11.19	8.71	3.33	12.04	1.01	1.53	1.75	21.99
	10.20	**8.32**	**3.58**	**11.90**	**.97**	**1.59**	**2.04**	**22.32**
		8.00	*1.50*	*9.50*	*1.00*	*1.67*	*1.75*	*19.68*
5078	12.51	8.65	4.26	12.91	3.49			13.78
5181	10.75	10.81	2.97	13.78	2.87			14.86
5324	10.69	10.16	3.99	14.15	2.60			15.17
5665	14.36	11.63	3.03	14.66	1.15			15.82
	12.08	**10.31**	**3.56**	**13.87**	**2.53**			**14.90**
		10.00	*2.00*	*12.00*	*3.00*			*13.00*
5228	13.00	9.59	1.78	11.37	1.05	1.29	2.40	21.03
5666	12.00	7.54	2.88	10.42	1.30	1.44	1.89	19.87

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
5667	S. G. K. C. Ammoniated Bone	J. T. Ford Merc. Co., Taylorsville
		Average
		Guarantee
5079	S. G. Plow Brand	Laurel Oil & Fert. Co., Laurel
5080	S. G. Plow Brand	S. S. Dale & Sons, Prentiss
5229	S. G. Plow Brand	J. P. Myer, Ellisville
5325	S. G. Plow Brand	Snowden Bros., Union
5668	S. G. Plow Brand	Laurel Oil & Fert. Co., Heidelberg
5669	S. G. Plow Brand	Hicks Merc. Co., Laurel
5670	S. G. Plow Brand	F. L. Riley Merc. Co., New Hebron
5671	S. G. Plow Brand	J. H. Thompson & Bros., Grange
5672	S. G. Plow Brand	McLean & O'Connell Co., Bassfield
5673	S. G. Plow Brand	Dorsett & Co., Richton
		Average
		Guarantee
	MARBACH & EAGAN, Crystal Springs, Miss.	
5465	Bat Guano	Lotterhos & Huber, Crystal Springs
5674	Bat Guano	Lotterhos & Huber, Crystal Springs
		Average
		Guarantee
	P. B. MATHIASON M'F'G. CO., St. Louis, Mo.	
5675	Increscent Brand H. G. Dissolved Bone	O'Gwynn & Wilkins, Buckatunna
		Guarantee
	MERIDIAN FERT. FACTORY, Meridian, Miss	
5083	S.G.Meridian Eng.Acid Phos.	F. W. Bransby, Macon
5327	S.G.Meridian Eng.Acid Phos.	J. M. Carter, Quitman
5676	S.G.Meridian Eng.Acid Phos.	J. K. Kirkland, Quitman
5677	S.G.Meridian Eng.Acid Phos.	T. B. Gaddis, Morton
5678	S.G.Meridian Eng.Acid Phos.	R. C. Coombs, Shuqualak
5679	S.G.Meridian Eng.Acid Phos.	Holloway & Worthy, Carson
5680	S.G.Meridian Eng.Acid Phos.	A. E. Dalrymple, Amory
		Average
		Guarantee
5081	H. G. Meridian Southern Acid Phosphate	Threefoot Bros. & Co., Meridian
5082	H. G. Meridian Southern Acid Phosphate	Meridian Fert. Factory, Meridian
5182	H. G. Meridian Southern Acid Phosphate	J. N. Tabor, Louisville
5326	H. G. Meridian Southern Acid Phosphate	Bonds, Youngblood & Co., Baldwyn
5681	H. G. Meridian Southern Acid Phosphate	The W. C. Ellis Co., Magee
5682	H. G. Meridian Southern Acid Phosphate	C. C. Hand, Enterprise

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5667	12.30	8.15	3.38	11.53	.54	1.28	1.95	$20.57
	12.43	**8.43**	**2.68**	**11.11**	**.98**	**1.34**	**2.08**	**20.50**
		8.00	*2.00*	*10.00*	*2.00*	*1.00*	*2.00*	*17.80*
5079	10.32	7.07	1.95	9.02	2.09	1.71	1.93	19.10
5080	10.08	6.87	2.71	9.58	1.92	1.83	1.99	20.54
5229	11.30	8.12	2.38	10.50	1.06	1.76	2.03	21.43
5325	9.05	8.25	2.60	10.85	1.33	1.70	1.99	21.55
5668	11.00	7.04	3.40	10.44	.95	1.89	1.52	21.27
5669	10.72	7.38	2.87	10.25	.74	1.99	1.65	21.62
5670	12.10	7.75	2.21	9.96	1.78	1.75	1.77	20.50
5671	11.76	6.79	2.73	9.52	1.19	1.72	1.84	19.87
5672	14.18	7.29	2.82	10.11	1.04	1.89	1.71	21.12
5673	12.41	7.77	2.30	10.07	1.38	1.75	1.82	20.67
	11.28	**7.43**	**2.60**	**10.03**	**1.35**	**1.80**	**1.83**	**20.80**
		7.00	*2.00*	*9.00*	*2.00*	*1.80*	*1.50*	*19.50*
5465	28.95				10.18	3.52	.66	19.83
5674	21.48				8.72	3.51	.66	19.06
	25.22				**9.45**	**3.52**	**.66**	**19.46**
					5.00	*4.25*	*.65*	*20.15*
5675	9.42	6.59	2.96	9.55	2.92	2.89	4.21	26.93
		6.00	*3.00*	*9.00*	*2.00*	*3.00*	*4.00*	*26.50*
5083	13.91	10.98	4.51	15.49	.50			16.59
5327	14.29	6.38	6.49	12.87	1.97			13.51
5676	16.26	8.20	4.84	13.04	1.01			13.86
5677	14.48	9.44	4.30	13.74	.70			14.68
5678	10.63	8.42	5.68	14.10	1.25			14.94
5679	12.84	10.87	4.00	14.87	.93			15.96
5680	13.59	9.20	5.25	14.45	1.07			15.37
	13.71	**9.07**	**5.01**	**14.08**	**1.06**			**14.99**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
5081	11.11	9.90	4.65	14.55	1.05			15.54
5082	11.38	9.94	4.44	14.38	1.02			15.37
5182	11.95	12.24	2.86	15.10	1.46			16.32
5326	11.06	9.38	5.03	14.41	1.34			15.35
5681	14.16	11.74	2.77	14.51	1.60			15.68
5682	13.43	9.16	4.65	13.81	.99			14.73

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
5683	H. G. Meridian Southern Acid Phosphate	Ford Bros. Co., Centreville
5684	H. G. Meridian Southern Acid Phosphate	J. J. Shelbourne, Toomsuba
5685	H. G. Meridian Southern Acid Phosphate	Bufkin & Davis, Waynesboro
5686	H. G. Meridian Southern Acid Phosphate	M. H. Turner, Vossburg
5687	H. G. Meridian Southern Acid Phosphate	State Line Merc. Co., State Line
5688	H. G. Meridian Southern Acid Phosphate	J. L. Wells, Hickory
5689	H. G. Meridian Southern Acid Phosphate	J. S. Turner & Co., Hattiesburg
		Average
		Guarantee
5328	S. G. Meridian Blood & Bone	Liberty Merc. Co., Liberty
5329	S. G. Meridian Blood & Bone	S. H. Floyd, Shubuta
5690	S. G. Meridian Blood & Bone	Wheeler Merc. Co., Pontotoc
5691	S. G. Meridian Blood & Bone	J. A. Taylor & Son, Pelahatchie
5692	S. G. Meridian Blood & Bone	Stevens & Ruffin, Richton
5693	S. G. Meridian Blood & Bone	Holloway & Worthy, Carson
5694	S. G. Meridian Blood & Bone	A. Roberts & Co., Lauderdale
		Average
		Guarantee
5084	S.G.Meridian Home Mixture	F. W. Bransby, Macon
5085	S.G.Meridian Home Mixture	Meridian Fert. Factory, Meridian
5086	S.G.Meridian Home Mixture	J. H. Williams & Sons, Prentiss
5087	S.G.Meridian Home Mixture	S. S. Dale & Sons, Prentiss
5088	S.G.Meridian Home Mixture	Story & Co., Forest
5089	S.G.Meridian Home Mixture	G. C. Rew, Forest
5090	S.G.Meridian Home Mixture	T. M. Steele, Forest
5137	S.G.Meridian Home Mixture	A. E. Dalrymple, Amory
5183	S.G.Meridian Home Mixture	J. N. Alexander & Co., Kosciusko
5184	S.G.Meridian Home Mixture	J. W. Gulley, Louisville
5299	S.G.Meridian Home Mixture	J. T. Ford Merc. Co., Taylorsville
5300	S.G.Meridian Home Mixture	Holloway & McRaney, Collins
5330	S.G.Meridian Home Mixture	T. W. Foard & Co., Eupora
5331	S.G.Meridian Home Mixture	John McGrath & Sons, Brookhaven
5332	S.G.Meridian Home Mixture	Gallaspy Bros. & Co., Union
5695	S.G.Meridian Home Mixture	Liberty Merc. Co., Liberty
5696	S.G.Meridian Home Mixture	J. P. McGehee & Sons, Gloster
5697	S.G.Meridian Home Mixture	Peets & Norman Co., Hazlehurst
5698	S.G.Meridian Home Mixture	G. R. Edwards, McCool
5699	S.G.Meridian Home Mixture	A. J. Gaston, Ackerman
5700	S.G.Meridian Home Mixture	Lann & Carter Hardware Co., Aberdeen
5701	S.G.Meridian Home Mixture	S. D. Bramlitt Hardware Co., Corinth
5702	S.G.Meridian Home Mixture	Phillips, Reinhart & Taylor Co., Booneville
5703	S.G.Meridian Home Mixture	A. W. Allen, Tupelo
5704	S.G.Meridian Home Mixture	R. R. Tate, Water Valley

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5683	13.95	11.42	3.05	14.47	1.24			$15.61
5684	13.70	12.11	2.79	14.90	1.27			16.11
5685	13.20	9.47	4.77	14.24	1.30			15.19
5686	14.35	13.19	1.50	14.69	1.32			16.01
5687	14.85	9.57	3.75	13.32	.82			14.28
5688	13.70	10.02	4.69	14.71	.54			15.71
5689	14.81	11.04	3.74	14.78	.84			15.88
	13.20	**10.71**	**3.74**	**14.45**	**1.14**			**15.52**
		12.00	*2.00*	*14.00*	*1.00*			*15.20*
5328	9.33	9.51	.35	9.86	1.13	1.79	2.52	21.48
5329	14.37	7.41	3.83	11.24	1.59	1.70	2.15	22.06
5690	15.07	7.18	5.13	12.31	1.25	1.83	1.82	23.40
5691	13.40	7.71	4.87	12.58	1.34	1.71	1.72	23.17
5692	8.45	5.30	5.01	10.31	.69	1.65	1.84	20.31
5693	12.31	6.69	3.63	10.32	.67	1.70	1.59	20.41
5694	14.06	7.20	4.96	12.16	1.65	1.72	1.77	22.75
	12.43	**7.29**	**3.97**	**11.26**	**1.19**	**1.73**	**1.91**	**21.94**
		8.00	*1.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.35*
5084	11.99	7.71	3.87	11.58	.50	1.49	1.82	21.29
5085	12.47	7.09	3.26	10.35	1.00	1.72	1.75	20.72
5086	11.40	5.27	3.72	8.99	.85	2.53	1.75	22.29
5087	10.13	6.22	4.48	10.70	1.04	1.77	1.89	21.36
5088	12.88	6.17	3.13	9.30	1.16	1.94	2.01	20.62
5089	11.86	7.73	3.33	11.06	.90	1.62	2.14	21.56
5090	13.80	6.37	3.14	9.51	1.33	1.89	2.42	21.08
5137	11.00	6.95	4.24	11.19	1.32	1.85	1.51	21.91
5183	12.43	7.57	2.72	10.29	1.66	1.67	2.24	21.00
5184	11.53	6.31	4.82	11.13	.92	1.75	2.02	21.89
5299	12.25	7.16	3.28	10.44	1.14	1.70	2.22	21.22
5300	14.43	7.23	3.34	10.57	1.16	1.57	2.14	20.77
5330	12.18	5.82	3.29	9.11	1.42	1.87	2.06	20.14
5331	7.78	6.50	3.89	10.39	1.20	1.67	2.12	20.88
5332	7.56	6.75	3.86	10.61	1.00	1.74	2.60	21.91
5695	13.41	6.95	3.78	10.73	1.13	1.66	1.71	20.85
5696	14.70	6.63	3.15	9.78	1.06	1.63	1.82	19.77
5697	13.37	6.87	4.20	11.07	.50	1.46	1.90	20.60
5698	13.45	7.20	3.93	11.13	.50	1.52	1.69	20.73
5699	14.75	6.52	4.18	10.70	.55	1.70	1.82	21.04
5700	14.30	7.68	3.14	10.82	.78	1.37	1.72	19.87
5701	13.13	7.25	3.45	10.70	1.00	1.50	1.96	20.46
5702	12.80	6.86	3.02	9.88	.36	1.79	1.81	20.52
5703	13.75	7.25	2.87	10.12	.42	1.69	1.75	20.37
5704	15.82	5.40	2.94	8.34	1.10	1.76	2.12	18.87

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
5705	S.G.Meridian Home Mixture	A. J. Cotton Merc. Co., Iuka
5706	S.G.Meridian Home Mixture	Max Ginsburger, Grenada
5707	S.G.Meridian Home Mixture	Wheeler Merc. Co., Pontotoc
5708	S.G.Meridian Home Mixture	Bonds, Youngblood & Co., Baldwyn
5709	S.G.Meridian Home Mixture	Miss.-Ala. Co-operative Co., State Line
5710	S.G.Meridian Home Mixture	W. J. Hubbard, Shuqualak
5711	S.G.Meridian Home Mixture	Bufkin & Davis, Waynesboro
5712	S.G.Meridian Home Mixture	Davis & Bufkin, Buckatunna
5713	S.G.Meridian Home Mixture	J. K. Kirkland, Quitman
5714	S.G.Meridian Home Mixture	M. W. Buckley & Sons, Enterprise
5715	S.G.Meridian Home Mixture	W. B. Richardson, Newton
5716	S.G.Meridian Home Mixture	T. B. Gaddis, Morton
5717	S.G.Meridian Home Mixture	O. Hopkins, Hickory
5718	S.G.Meridian Home Mixture	J. A. Taylor & Son, Pelahatchie
5719	S.G.Meridian Home Mixture	Hawkins & Co., Hattiesburg
5720	S.G.Meridian Home Mixture	Hicks Merc. Co., Laurel
5721	S.G.Meridian Home Mixture	J. E. McNair, Lumberton
5722	S.G.Meridian Home Mixture	R. E. Wilkinson Merc. Co., Poplarville
5723	S.G.Meridian Home Mixture	M. H. Turner, Vossburg
5724	S.G.Meridian Home Mixture	J. P. Myer, Ellisville
5725	S.G.Meridian Home Mixture	R. Watts & Co., Seminary
5726	S.G.Meridian Home Mixture	Overstreet & Ruffis, Beaumont
5727	S.G.Meridian Home Mixture	R. J. Burnett, Bay Springs
5728	S.G.Meridian Home Mixture	McLean & O'Connell Co., Bassfield
5729	S.G.Meridian Home Mixture	Sumrall Merc. Co., Sumrall
5730	S.G.Meridian Home Mixture	McIntyre & Burnham, D'Lo
5731	S.G.Meridian Home Mixture	Barnes, Ruffin & Co., Columbia
5732	S.G.Meridian Home Mixture	Holloway & Worthy, Carson
5733	S.G.Meridian Home Mixture	Johnson-Woodward Co., Mt. Olive
5734	S.G.Meridian Home Mixture	McLeod & Co., Purvis
5735	S.G.Meridian Home Mixture	J. J. Dickson, McHenry
5736	S.G.Meridian Home Mixture	Smith, Longino & Thompson, Grange
5737	S.G.Meridian Home Mixture	Berry & Murray, Star
5738	S.G.Meridian Home Mixture	Boswell Bros., Weathersby
5739	S.G.Meridian Home Mixture	Donald Bros. & Co., Magee
		Average
		Guarantee
5091	H.G.Meridian Veg. Grower	Meridian Fert. Factory, Meridian
5740	H.G.Meridian Veg. Grower	Holloway & McRaney, Collins
		Average
		Guarantee
5092	S.G.Meridian German Kainit	Meridian Fert. Factory, Meridian
5741	S.G.Meridian German Kainit	J. J. Shelbourne, Toomsuba
		Average
		Guarantee
	New Orleans Acid & Fert. Company, New Orleans, La.	
5742	S. G. Black Diamond Acid Phosphate	T. J. Bonner Co., Laurel

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5705	12.25	6.51	3.89	10.40	.96	1.66	1.96	$20.69
5706	13.60	6.05	3.54	9.59	1.27	1.67	2.01	19.84
5707	14.00	6.88	3.98	10.86	.92	1.62	1.85	20.96
5708	15.21	7.66	3.29	10.95	.59	1.84	2.10	22.27
5709	15.27	6.83	3.09	9.92	.61	1.64	2.28	20.44
5710	13.27	6.88	2.49	9.37	2.56	1.78	1.78	19.90
5711	15.35	6.88	3.21	10.09	.70	1.78	2.23	21.14
5712	12.90	7.27	3.62	10.89	.82	1.62	2.02	21.21
5713	14.00	6.81	3.09	9.90	1.07	1.73	2.30	20.79
5714	14.86	7.25	3.64	10.89	.51	1.84	1.80	21.85
5715	12.30	6.59	3.34	9.93	3.84	1.71	2.24	20.66
5716	12.34	7.78	3.35	11.13	1.02	1.62	1.84	21.34
5717	13.63	6.95	3.27	10.22	1.14	1.85	1.81	21.15
5718	14.83	7.66	3.16	10.82	.54	1.59	2.04	21.07
5719	12.25	7.45	3.26	10.71	1.06	1.68	1.90	21.15
5720	12.33	6.28	4.21	10.49	.63	1.76	2.67	21.88
5721	11.62	6.67	4.69	11.36	1.27	1.40	1.97	20.73
5722	13.01	7.48	2.91	10.39	1.77	1.61	2.21	20.83
5723	11.50	7.33	2.95	10.28	1.84	1.69	2.56	21.36
5724	10.80	7.93	2.22	10.15	2.09	1.67	2.03	20.67
5725	11.09	6.91	4.01	10.92	.61	1.75	2.30	22.00
5726	10.59	6.49	4.39	10.88	.65	1.68	2.53	21.87
5727	12.06	6.73	4.10	10.83	.52	1.70	2.47	21.86
5728	11.15	6.49	4.12	10.61	1.62	1.51	2.00	20.36
5729	11.93	8.05	3.30	11.35	1.06	1.44	1.82	20.87
5730	13.70	6.82	3.67	10.49	.63	1.70	1.98	21.00
5731	12.15	7.06	3.99	11.05	1.13	1.46	1.86	20.56
5732	12.50	6.49	4.40	10.89	.67	1.67	1.85	21.16
5733	11.40	7.20	3.42	10.62	.97	1.65	1.94	20.94
5734	11.38	7.10	4.13	11.23	1.09	1.47	1.70	20.64
5735	12.26	7.45	3.88	11.33	.91	1.48	1.55	20.68
5736	12.33	7.38	3.36	10.74	.84	1.60	1.86	20.81
5737	13.05	6.84	3.61	10.45	1.13	1.71	1.85	20.87
5738	11.60	7.00	4.21	11.21	.52	1.72	1.78	21.69
5739	10.37	6.68	4.16	10.84	.83	1.65	2.03	21.22
	12.60	**6.92**	**3.58**	**10.50**	**1.02**	**1.68**	**2.00**	**20.96**
		8.00	*1.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.35*
5091	11.16	6.81	4.28	11.09	.47	2.21	4.60	26.32
5740	14.99	6.96	2.22	9.18	.56	2.44	5.51	26.06
	13.08	**6.89**	**3.25**	**10.14**	**.52**	**2.32**	**5.06**	**26.19**
		6.00	*2.00*	*8.00*	*1.00*	*2.50*	*5.00*	*24.40*
5092	4.91						12.60	12.60
5741	3.55						12.10	12.10
	4.23						**12.35**	**12.35**
							12.00	*12.00*
5742	10.45	10.45	4.62	15.07	.31			16.12

Laboratory Number	Name of Brand and Manufacturer.	Where and from Whom Collected.
5743	S. G. Black Diamond Acid Phosphate	J. A. Goree, Columbus
		Average
		Guarantee
5744	S.G.Crescent City Acid Phos.	M. H. Clayton, Heidelberg
5745	S.G.Crescent City Acid Phos.	Ainsworth-Mayfield Co., Taylorsville
		Average
		Guarantee
5333	S.G.Blood, Bone and Beef	J. L. Moyse & Bro., Summit
5746	S.G.Blood, Bone and Beef	Florence Merc. Co., Florence
		Average
		Guarantee
5334	S.G.Blood, Bone and Potash	McComb City Merc. Co., McComb City
5747	S.G.Blood, Bone and Potash	J. P. Myer, Ellisville
		Average
		Guarantee
5748	S.G.Gold Dust	Max Kahn, Gloster
5749	S. G. Gold Dust	R. W. Fagan & Co., Waynesboro
		Average
		Guarantee
5750	S.G.Goldsmith's Imp. Mix.	W. E. Payne Merc. Co., Collins
5751	S.G.Goldsmith's Imp. Mix.	McLean & O'Connell Co., Bassfield
5752	S.G.Goldsmith's Imp. Mix.	P. Didlake, Star
		Average
		Guarantee
5336	S.G.German Kainit	McComb City Merc. Co., McComb City
		Guarantee
	Newton Oil & M'f'g. Co., Newton, Miss.	
5217	S. G. Acid Phosphate	Smythe, Gaddis & Co., Forest
5337	S. G. Acid Phosphate	Holland, Williams & Co., Union
5753	S. G. Acid Phosphate	Houston Hardware Co., Houston
		Average
		Guarantee
5185	S. G. Banner C. & C. Brand	M. A. Metts, Louisville
5754	S. G. Banner C. & C. Brand	J. M. Evans & Son, Pelahatchie
5755	S. G. Banner C. & C. Brand	Sumner Bros., Morton
5756	S. G. Banner C. & C. Brand	Houston Hardware Co., Houston
5757	S. G. Banner C. & C. Brand	McMullans & Sons, Hickory
		Average
		Guarantee
5093	S. G. Pine Land Guano	Smythe-Gaddis & Co., Forest
5186	S. G. Pine Land Guano	M. A. Metts, Louisville
5338	S. G. Pine Land Guano	Spivey & Scarborough, Decatur
5758	S. G. Pine Land Guano	J. W. Johnson, Noxapater
5759	S. G. Pine Land Guano	Loper & Gilbert, Lake
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5743	11.70	9.94	4.54	14.48	.40			$15.47
	11.08	**10.20**	**4.58**	**14.78**	**.36**			**15.80**
		10.00	*2.00*	*12.00*	*2.00*			*13.00*
5744	12.40	7.19	5.88	13.07	.28			13.79
5745	10.90	7.38	6.10	13.48	.38			14.22
	11.65	**7.29**	**5.99**	**13.28**	**.33**			**14.01**
		10.00	*2.00*	*12.00*	*2.00*			*13.00*
5333	10.45	5.37	4.68	10.05	.56	1.97	1.94	21.41
5746	16.24	6.73	3.88	10.61	.59	1.92	1.78	21.80
	13.35	**6.05**	**4.28**	**10.33**	**.58**	**1.95**	**1.86**	**21.62**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.50*	*18.70*
5334	10.40	7.61	3.17	10.78	.36	1.71	1.89	21.35
5747	14.37	5.27	4.71	9.98	.43	1.78	1.51	20.14
	12.39	**6.44**	**3.94**	**10.38**	**.40**	**1.75**	**1.70**	**20.76**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.50*	*18.70*
5748	19.76	2.99	6.72	9.71	1.11	1.67	1.50	19.16
5749	14.70	8.06	2.39	10.45	.37	1.13	1.62	18.44
	17.23	**5.53**	**4.55**	**10.08**	**.74**	**1.40**	**1.56**	**18.80**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.50*	*18.70*
5750	10.90	5.85	4.27	10.12	1.20	1.47	1.26	18.86
5751	11.30	7.34	2.05	9.39	.40	1.59	1.50	18.92
5752	12.65	6.68	2.47	9.15	.81	1.70	1.56	19.09
	11.62	**6.62**	**2.93**	**9.55**	**.80**	**1.59**	**1.44**	**18.96**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.50*	*18.70*
5336	1.15						12.92	12.92
							12.00	*12.00*
5217	10.60	7.91	4.34	12.25	.75			13.04
5337	9.54	4.02	8.69	12.71	.90			13.11
5753	9.16	6.64	6.41	13.05	.67			13.71
	9.77	**6.19**	**6.48**	**12.67**	**.77**			**13.29**
		10.00	*2.00*	*12.00*	*1.00*			*13.00*
5185	11.03	4.50	2.90	7.40	.72	2.29	2.54	20.29
5754	10.36	5.35	2.76	8.11	.31	1.70	2.66	18.92
5755	13.15	7.15	3.83	10.98	.45	1.65	2.25	21.64
5756	12.30	5.56	3.03	8.59	.35	1.39	2.25	17.82
5757	10.60	4.71	3.58	8.29	.43	1.38	2.45	17.56
	11.49	**5.46**	**3.22**	**8.68**	**.45**	**1.68**	**2.43**	**19.25**
		7.00	*1.50*	*8.50*	*1.00*	*1.65*	*2.25*	*18.90*
5093	12.00	5.30	3.23	8.53	.54	1.80	2.35	19.46
5186	13.60	4.25	2.90	7.15	.77	2.25	2.46	19.75
5338	8.47	8.07	1.06	9.13	.46	1.38	3.01	19.38
5758	12.10	4.09	3.00	7.09	.36	2.11	2.58	19.23
5759	9.20	5.12	3.56	8.68	.37	1.67	2.46	19.20
	11.07	**5.37**	**2.75**	**8.12**	**.50**	**1.84**	**2.57**	**19.40**
		7.00	*1.50*	*8.50*	*1.00*	*1.65*	*2.25*	*18.90*

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	PLANTERS FERTILIZER & CHEMICAL CO., New Orleans, La.	
5339	S. G. Planter's Cotton & Corn No. 1	The Hyman Merc. Co., Summit
5760	S. G. Planter's Cotton & Corn No. 1	The Hyman Merc. Co., Summit
		Average
		Guarantee
5761	S.G.Planter's Golden Mix.	McLain & Ratcliff, Gloster
5762	S.G.Planter's Golden Mix.	The W. L. Robinson Co., Liberty
5763	S.G.Planter's Golden Mix.	Robinson Merc. Co. Centreville
		Average
		Guarantee
5340	S. G. Planter's R. B. Superphosphate	The Hyman Merc. Co., Summit
5764	S. G. Planter's R. B. Superphosphate	Robinson Merc. Co., Centreville
		Average
		Guarantee
	REFUGE COTTON OIL CO., Columbus, Miss.	
5765	H.G.Refuge Acid Phosphate	King Hardware Co., New Albany
5766	H.G.Refuge Acid Phosphate	Vaughn & Harris, Steenston
		Average
		Guarantee
5138	S. G. Columbus Home Made Fertilizer	Refuge Cotton Oil Co., Columbus
5187	S. G. Columbus Home Made Fertilizer	R. G. Harris, Steenston
5767	S. G. Columbus Home Made Fertilizer	Houston Hardware & Furn. Co. Houston
5768	S. G. Columbus Home Made Fertilizer	J. T. McClure, Shuqualak
5769	S. G. Columbus Home Made Fertilizer	King Hardware Co., New Albany
5770	S. G. Columbus Home Made Fertilizer	T. W. Foard & Co., Eupora
		Average
		Guarantee
	SHUBUTA OIL & M'F'G. CO., Shubuta, Miss.	
5341	Shubuta H. G. Acid Phos.	Shubuta Oil & M'f'g. Co., Shubuta
		Guarantee
5342	S. G. Shubuta Mixture	Shubuta Oil & M'f'g. Co., Shubuta
		Guarantee
5343	S. G. German Kainit	Shubuta Oil & M'f'g. Co., Shubuta
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5339	9.63	7.78	3.11	10.89	1.64	1.52	2.52	$21.36
5760	12.17	8.01	3.32	11.33	.81	1.52	1.87	21.21
	10.90	**7.89**	**3.22**	**11.11**	**1.23**	**1.52**	**2.19**	**21.28**
		7.00	*2.50*	*9.50*	*2.00*	*1.65*	*1.50*	*19.25*
5761	12.80	7.01	2.76	9.77	1.53	2.07	1.90	21.63
5762	12.70	7.94	2.51	10.45	.61	1.56	1.97	20.50
5763	11.45	7.70	3.11	10.81	1.82	1.66	1.70	21.00
	12.32	**7.55**	**2.80**	**10.34**	**1.32**	**1.76**	**1.86**	**21.04**
		7.50	*2.00*	*9.50*	*2.00*	*1.65*	*1.50*	*19.30*
5340	9.06	7.22	3.02	10.24	1.29	2.05	1.72	21.91
5764	11.98	6.23	3.46	9.69	.70	2.26	1.43	21.75
	10.52	**6.73**	**3.24**	**9.97**	**.99**	**2.15**	**1.58**	**21.83**
		7.00	*2.50*	*9.50*	*2.00*	*1.65*	*1.50*	*19.25*
5765	13.77	11.82	4.29	16.11	.42			17.29
5766	9.72	10.08	6.61	16.69	.86			17.70
	11.79	**10.95**	**5.45**	**16.40**	**.64**			**17.50**
		12.00	*2.00*	*14.00*	*2.00*			*15.20*
5138	9.85	7.69	3.99	11.68	1.07	1.47	2.02	21.52
5187	10.45	7.18	4.29	11.47	.87	1.45	2.00	21.14
5767	13.55	8.61	2.73	11.34	.27	1.68	1.77	21.83
5768	12.05	6.61	3.61	10.22	.51	1.76	1.92	20.86
5769	12.33	7.07	3.25	10.32	.58	1.75	1.76	20.82
5770	11.77	7.39	3.68	11.07	.90	1.47	1.85	20.65
	11.67	**7.43**	**3.59**	**11.02**	**.70**	**1.60**	**1.88**	**21.14**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.90*
5341	9.45	12.95	3.50	16.45	1.68			17.75
		10.00	*4.00*	*14.00*	*1.00*			*15.00*
5342	9.68	6.96	2.30	9.26	2.17	1.88	2.72	21.12
		6.00	*3.00*	*9.00*	*1.00*	*1.65*	*1.60*	*18.70*
5343	.55						13.52	13.52
							12.00	*12.00*

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	SOUTHERN OIL & FERT. CO., Meridian, Miss.	
5094	Southern's S. G. Acid Phos.	Southern Oil & Fert. Co., Meridian
		Guarantee
5095	Southern's 20th Century H. G. Acid Phosphate	Southern Oil & Fert. Co., Meridian
		Guarantee
5096	Southern's S. G. Cot. Grower	Southern Oil & Fert Co., Meridian
5097	Southern's S. G. Cot. Grower	Meyer Bros., Meridian
5545	Southern's S. G. Cot. Grower	K. Green, Shuqualak
5546	Southern's S. G. Cot. Grower	J. W. McKay, Buckatunna
		Average
		Guarantee
5098	Southern's S. G. Superior	Southern Oil & Fert. Co., Meridian
5547	Southern's S. G. Superior	W. M. McGough & Sons, Morton
5548	Southern's S. G. Superior	Weatherbee-Huggins Co., Waynesboro
		Average
		Guarantee
5099	S. G. Southern's German Kainit	Southern Oil & Fert. Co., Meridian
		Guarantee
	STANDARD GUANO & CHEMICAL M'F'G. COMPANY, New Orleans, La.	
5188	H. G. Stern's Acid Phosphate	The T. J. Hubbard Co., Magee
5230	H. G. Stern's Acid Phosphate	The R. W. Hinton Co., Lumberton
5771	H. G. Stern's Acid Phosphate	Barnes & Ruffin, Columbia
5772	H. G. Stern's Acid Phosphate	James & Lawson, Mendenhall
5773	H. G. Stern's Acid Phosphate	Dunagin & Whitaker, Laurel
		Average
		Guarantee
5774	S. G. Stern's Acid Phosphate	E. M. Carter, Centreville
		Guarantee
5344	S. G. Blood, Bone & Meat	C. Atkinson's Sons Co., Summit
5775	S. G. Blood, Bone & Meat	I. N. Varnado's Sons Co., Osyka
		Average
		Guarantee
5189	S. G. Champion Farmer's Choice	G. Lowenberg, Kosciusko
5231	S. G. Champion Farmer's Choice	The R. W. Hinton Co., Lumberton
		Average
		Guarantee
5190	S. G. Miss. Home Guano	The T. J. Hubbard Co., Magee
5218	S. G. Miss. Home Guano	W. A. Turner & Co., Forest
5345	S. G. Miss. Home Guano	Max Priebatsch, Brookhaven
5776	S. G. Miss. Home Guano	Dr. C. C. Ewing, Aberdeen
5777	S. G. Miss. Home Guano	Hudson & Co., Sumrall
5778	S. G. Miss. Home Guano	Wm. Atkinson & Bacot Co., Osyka
5779	S. G. Miss. Home Guano	C. Atkinson's Sons Co., Summit
5780	S. G. Miss. Home Guano	R. L. Berry & Co., Prentiss

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5094	14.68	8.47	5.18	13.65	2.02			$14.50
		9.00	*3.00*	*12.00*	*2.00*			*12.90*
5095	11.09	13.73	4.26	17.99	1.65			19.36
		10.00	*4.00*	*14.00*	*2.00*			*15.00*
5096	13.32	5.11	3.65	8.76	1.71	1.35	1.59	17.14
5097	12.72	5.07	3.70	8.77	1.68	1.46	1.59	17.58
5545	11.60	5.39	3.82	9.21	1.15	1.72	1.87	19.42
5546	11.54	5.77	3.32	9.09	.92	1.53	2.31	19.01
	12.30	**5.33**	**3.62**	**8.95**	**1.37**	**1.52**	**1.84**	**18.29**
		6.00	*3.00*	*9.00*	*1.00*	*1.65*	*1.00*	*18.10*
5098	9.61	6.64	4.69	11.33	.88	1.12	.99	18.60
5547	11.85	5.54	2.95	8.49	1.11	1.66	2.65	19.18
5548	13.47	4.35	3.18	7.53	.77	2.10	1.90	19.02
	11.64	**5.51**	**3.61**	**9.12**	**.92**	**1.63**	**1.85**	**18.94**
		5.00	*3.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.90*
5099	2.00						12.54	12.54
							12.00	*12.00*
5188	14.43	9.83	3.21	13.04	2.64			14.02
5230	14.65	12.40	2.50	14.90	.99			16.14
5771	10.66	8.42	4.50	12.92	2.55			13.76
5772	12.11	10.29	3.85	14.14	1.70			15.17
5773	13.05	11.58	4.31	15.89	.90			17.05
	12.98	**10.50**	**3.68**	**14.18**	**1.76**			**15.23**
		12.00	*2.00*	*14.00*	*2.00*			*15.20*
5774	13.76	11.44	4.21	15.65	.77			16.79
		10.00	*2.00*	*12.00*	*2.00*			*13.00*
5344	10.81	7.29	3.71	11.00	2.34	1.57	2.09	21.20
5775	13.53	6.38	4.46	10.84	1.60	1.80	1.50	21.26
	12.17	**6.83**	**4.09**	**10.92**	**1.97**	**1.69**	**1.79**	**21.23**
		7.00	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.25*
5189	13.40	6.75	2.49	9.24	1.98	1.76	1.45	19.33
5231	11.30	8.21	2.12	10.33	1.54	1.62	1.63	20.29
	12.35	**7.48**	**2.30**	**9.78**	**1.76**	**1.69**	**1.54**	**19.81**
		7.00	*2.50*	*9.50*	*1.00*	*1.65*	*1.00*	*18.75*
5190	13.03	7.32	2.45	9.77	1.80	1.72	2.11	20.47
5218	13.87	8.10	2.31	10.41	1.24	1.46	2.62	20.72
5345	9.71	8.01	1.50	9.51	1.28	1.84	2.72	21.34
5776	13.02	7.15	3.29	10.44	.81	1.62	1.76	20.44
5777	12.32	7.28	3.44	10.72	1.23	1.30	1.50	19.22
5778	12.13	7.24	3.43	10.67	1.11	1.77	1.73	21.27
5779	14.58	8.37	3.00	11.37	.81	1.63	1.82	21.68
5780	12.44	6.91	3.00	9.91	1.16	1.75	1.82	20.41

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
5781	S. G. Miss. Home Guano	Dorsett & Co., Richton
		Average
		Guarantee
5782	H.G.Pure Raw Ground Bone	Osyka Merc. Co., Osyka
5783	H.G.Pure Raw Ground Bone	McLeod & Co., Purvis
		Average
		Guarantee
5100	S. G. Stern's Am. R. B. Superphosphate	J. H. Williams & Sons, Prentiss
5191	S. G. Stern's Am. R. B. Superphosphate	The T. J. Hubbard Co., Magee
5219	S. G. Stern's Am. R. B. Superphosphate	W. A. Turner & Co., Forest
5232	S. G. Stern's Am. R. B. Superphosphate	Burkett, Burrow & Co., Columbia
5233	S. G. Stern's Am. R. B. Superphosphate	The Lampton Co., Columbia
5301	S. G. Stern's Am. R. B. Superphosphate	J. S. Eaton & Bro., Taylorsville
5346	S. G. Stern's Am. R. B. Superphosphate	Lampton Merc. Co., Magnolia
5347	S. G. Stern's Am. R. B. Superphosphate	The Hyman Merc. Co., Summit
5784	S. G. Stern's Am. R. B. Superphosphate	Wise Merc. Co., Hazlehurst
5785	S. G. Stern's Am. R. B. Superphosphate	Watts Merc. Co., Sandersville
5786	S. G. Stern's Am. R. B. Superphosphate	James & Lawson, Mendenhall
5787	S. G. Stern's Am. R. B. Superphosphate	S. Bernheimer & Sons, Port Gibson
5788	S. G. Stern's Am. R. B. Superphosphate	F. L. Riley Merc. Co., New Hebron
5789	S. G. Stern's Am. R. B. Superphosphate	S. S. Dale & Son, Prentiss
5790	S. G. Stern's Am. R. B. Superphosphate	Fountain-Mimms Co., Ellisville
5791	S. G. Stern's Am. R. B. Superphosphate	Doyle Kervin, Collins
5792	S. G. Stern's Am. R. B. Superphosphate	Wm. Atkinson & Bacot Co., Osyka
5793	S. G. Stern's Am. R. B. Superphosphate	Rawls & Lampton Co., Silver Creek
5794	S. G. Stern's Am. R. B. Superphosphate	Hawkins & McRaney Co., Bassfield
		Average
		Guarantee
5234	S. G. German Kainit	The R. W. Hinton Co., Lumberton
5348	S. G. German Kainit	C. Atkinson's Sons Co., Summit

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5781	9.85	7.07	4.39	11.46	.87	1.94	1.67	22.74
	12.33	**7.49**	**2.99**	**10.48**	**1.15**	**1.67**	**1.97**	**20.92**
		7.00	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.25*
5782	5.64				17.84	2.96		20.76
5783	5.04				18.37	3.00		21.19
	5.34				**18.12**	**2.98**		**20.98**
					18.50	*2.50*		*19.25*
5100	13.62	6.70	3.31	10.01	2.10	1.57	1.92	19 88
5191	13.43	6.68	3.21	9.89	2.60	1.98	1.69	21.16
5219	13.27	7.02	3.60	10.62	2.21	1.76	2.11	21.53
5232	13.72	7.71	2.96	10.67	1.43	1.82	1.94	21.73
5233	12.63	7.64	3.96	11.60	1.69	1.60	1.72	21.64
5301	13.45	6.69	3.47	10.16	1.85	1.80	1.85	20.90
5346	10.53	6.93	2.59	9.52	2.56	1.76	1.97	20.18
5347	12.13	7.55	2.57	10.12	2.12	1.81	1.99	21.12
5784	18.96	7.09	3.87	10.96	1.19	1.70	1.29	20.86
5785	15.00	6.88	4.31	11.19	1.41	1.56	1.30	20.54
5786	12.90	7.16	3.80	10.96	1.22	1.85	1.57	21.74
5787	16.15	7.04	3.52	10.56	1.01	1.73	1.50	20.74
5788	14.10	7.19	3.85	11.04	1.20	1.66	1.50	21.00
5789	16.22	6.78	3.76	10.54	1.09	1.70	1.57	20.64
5790	12.35	6.90	3.83	10.73	1.25	1.69	1.53	20.78
5791	14.20	6.55	4.56	11.11	1.27	1.72	1.35	21.11
5792	12.43	7.50	3.94	11.44	1.07	1.68	1.42	21.47
5793	11.18	6.58	3.96	10.54	1.27	1.82	1.62	21.15
5794	13.01	6.83	3.75	10.58	1.61	1.76	1.42	20.78
	13.65	**7.02**	**3.63**	**10.65**	**1.59**	**1.73**	**1.65**	**21.00**
		7.00	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.25*
5234	1.03						12.74	12.74
5348	1.10						12.90	12.90

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
5795	S. G. German Kainit	James & Lawson, Mendenhall
		Average
		Guarantee
	SWIFT FERTILIZER WORKS, Atlanta, Ga.	
5235	Swift's Cot. Plant S.G.Guano	J. P. Myer, Ellisville
5796	Swift's Cot.Plant S.G.Guano	Dr. C. C. Ewing, Aberdeen
		Average
		Guarantee
5349	Swift's Eagle H. G. Guano	R.W. Carter, Iuka
		Guarantee
5350	Swift's Golden Harvest S. G. Guano	Planters Merc. Co., Baldwyn
5797	Swift's Golden Harvest S. G. Guano	Watts Merc. Co., Sandersville
		Average
		Guarantee
5798	Swift's S. G. Red Steer	A. J. Gaston, Ackerman
5799	Swift's S. G. Red Steer	Calhoun & Son, Coffeeville
		Average
		Guarantee
	TENNESSEE CHEMICAL CO., Nashville, Tenn.	
5139	S. G. Ox Cotton Guano	A. J. Gaston, Ackerman
5800	S. G. Ox Cotton Guano	Winona Hardware Co., Winona
		Average
		Guarantee
	TENNESSEE VALLEY FERT. COMPANY, Florence, Ala.	
5351	H. G. Florence Fertilizer	W. L. Bourland, Amory
		Guarantee
5101	S. G. King Cotton Grower	J. G. Callicott & Son, Iuka
5801	S. G. King Cotton Grower	J. J. Rogers, Tupelo
		Average
		Guarantee
	THREEFOOT BROS. & CO., Meridian, Miss.	
5102	Threefoot's H. G. English Acid Phosphate	Threefoot Bros. & Co., Meridian
5802	Threefoot's H. G. English Acid Phosphate	Threefoot Bros. & Co., Meridian
		Average
		Guarantee
5103	Threefoot's S. G. Imp. Mix.	Threefoot Bros. & Co., Meridian
5140	Threefoot's S. G. Imp. Mix.	Threefoot Bros. & Co., Meridian
5803	Threefoot's S. G. Imp. Mix.	L. L. Price, Toomsuba
5804	Threefoot's S. G. Imp. Mix.	Threefoot Bros. & Co., Meridian
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5795	.72						12.54	12.54
	.95						**12.73**	**12.73**
							12.00	*12.00*
5235	7.60	7.57	2.80	10.37	.93	1.70	1.74	20.70
5796	8.24	4.54	5.24	9.78	2.02	1.28	1.25	17.58
	7.92	**6.05**	**4.02**	**10.07**	**1.47**	**1.49**	**1.50**	**19.14**
		6.00	*3.00*	*9.00*	*1.50*	*1.65*	*1.00*	*18.10*
5349	8.65	8.15	2.56	10.71	1.25	1.64	2.93	22.09
		6.50	*3.50*	*10.00*	*1.50*	*1.65*	*2.00*	*20.25*
5350	7.81	7.46	2.46	9.92	1.28	1.72	2.82	21.36
5797	6.70	5.04	4.20	9.24	1.97	1.79	2.54	20.37
	7.25	**6.25**	**3.33**	**9.58**	**1.62**	**1.76**	**2.68**	**20.88**
		5.50	*2.50*	*8.00*	*1.50*	*1.65*	*2.00*	*17.95*
5798	6.27	5.01	4.18	9.19	1.09	1.70	2.77	20.18
5799	5.18	4.39	4.02	8.41	1.16	2.02	2.12	19.89
	5.72	**4.70**	**4.10**	**8.80**	**1.13**	**1.81**	**2.45**	**20.04**
		5.50	*2.50*	*8.00*	*1.50*	*1.65*	*2.00*	*17.95*
5139	10.68	8.14	3.18	11.32	1.28	1.72	1.52	21.67
5800	9.90	6.84	4.02	10.86	.82	1.52	1.27	19.98
	10.29	**7.49**	**3.60**	**11.09**	**1.05**	**1.62**	**1.40**	**20.83**
		6.00	*4.00*	*10.00*	*1.00*	*1.65*	*1.00*	*19.20*
5351	11.11	7.78	1.89	9.67	3.33	1.32	3.50	20.20
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*20.40*
5101	11.84	7.68	2.46	10.14	2.72	1.49	1.34	19.22
5801	12.23	6.06	4.37	10.43	2.00	1.22	1.53	18.49
	12.03	**6.87**	**3.42**	**10.29**	**2.36**	**1.35**	**1.44**	**18.85**
		7.00	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*18.20*
5102	12.06	13.15	3.17	16.32	.75			17.64
5802	12.56	11.01	4.38	15.39	.69			16.49
	12.31	**12.08**	**3.78**	**16.36**	**.72**			**17.07**
		13.00	*2.00*	*15.00*	*1.00*			*16.30*
5103	11.13	7.09	3.61	10.70	1.15	1.69	1.18	20.42
5140	13.17	7.93	3.83	11.76	.96	1.87	1.30	22.51
5803	14.47	7.41	3.88	11.29	.29	1.69	2.16	22.08
5804	13.79	8.16	3.45	11.61	.45	1.64	1.68	21.83
	13.14	**7.65**	**3.70**	**11.35**	**.71**	**1.72**	**1.58**	**21.71**
		7.50	*2.00*	*9.50*	*1.00*	*1.64*	*1.60*	*19.36*

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
	TUPELO FERTILIZER FACTORY, Tupelo, Miss.	
5432	H. G. Cotton Belt Acid Phos.	Clark Grocery Co., Tupelo
5805	H. G. Cotton Belt Acid Phos.	Baldwyn Supply Co., Baldwyn
5806	H. G. Cotton Belt Acid Phos.	R. T. Rutledge, Iuka
		Average
		Guarantee
5141	S. G. Cotton Belt Fertilizer	Barnett, Davis Supply Co., Booneville
5142	S. G. Cotton Belt Fertilizer	Gilmore & May Co., Amory
5143	S. G. Cotton Belt Fertilizer	Union Mercantile Co., New Albany
5352	S. G. Cotton Belt Fertilizer	L. A. Latham, Pontotoc
5353	S. G. Cotton Belt Fertilizer	Brand-West Hardware Co., Houston
5807	S. G. Cotton Belt Fertilizer	Guntown Merc. Co., Guntown
5808	S. G. Cotton Belt Fertilizer	W. T. Adams Mill Co., Corinth
5809	S. G. Cotton Belt Fertilizer	Wygull Bros., Nettleton
5810	S. G. Cotton Belt Fertilizer	Lann & Carter Hdw. Co., Aberdeen
		Average
		Guarantee
5145	S. G. Tupelo Fertilizer	J. D. Bryan, Nettleton
5811	S. G. Tupelo Fertilizer	L. L. Grace & Co., New Albany
5812	S. G. Tupelo Fertilizer	M. L. Finger & Son, Ripley
		Average
		Guarantee
	VIRGINIA-CAROLINA CHEMICAL COMPANY, Memphis, Tenn.	
5104	S. G. I. X. L. Acid Phos.	W. W. Harris & Son, Iuka
5105	S. G. I. X. L. Acid Phos.	Meyer Bros., Meridian
5813	S. G. I. X. L. Acid Phos.	Tucker & Buford, Pickens
5814	S. G. I. X. L. Acid Phos.	Mullen & Green, Amory
5815	S. G. I. X. L. Acid Phos.	R. W. Fagan & Co., Waynesboro
		Average
		Guarantee
5106	S. G. Royal Acid Phosphate	Winner, Klein & Co., Meridian
5192	S. G. Royal Acid Phosphate	Bennett Bros. & McMillin, Louisville
5816	S. G. Royal Acid Phosphate	Biloxi Milling Co., Biloxi
		Average
		Guarantee
5354	Scott's H. G. Acid Phos.	Wetherbee-Huggins Co., Waynesboro
5817	Scott's H. G. Acid Phos.	M. A. Green, Holly Springs
5818	Scott's H. G. Acid Phos.	T. D. Rees & Co., Booneville
		Average
		Guarantee
5356	S. G. Mobile Double Eagle Guano	Dunn Bros., Summit
5433	S. G. Mobile Double Eagle Guano	T. J. Cole & Co., Ripley
5822	S. G. Mobile Double Eagle Guano	The W. C. Ellis Co., Magee
5823	S. G. Mobile Double Eagle Guano	Mrs. R. J. Briggs, Jr., State Line

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5432	12.29	11.53	3.10	14.63	1.27			15.78
5805	13.26	11.54	3.00	14.54	1.02			15.69
5806	12.26	11.44	4.01	15.45	.32			16.59
	12.60	**11.50**	**3.37**	**14.87**	**.87**			**16.02**
		12.00	*2.00*	*14.00*	*2.00*			*15.20*
5141	11.40	7.96	2.61	10.57	.69	1.65	1.81	20.83
5142	11.51	7.39	2.55	9.94	.95	1.94	1.86	21.29
5143	11.43	7.64	2.79	10.43	.78	1.88	1.74	21.50
5352	10.85	8.70	2.83	11.53	.54	1.38	1.82	20.89
5353	10.20	8.05	2.33	10.38	.92	1.72	1.97	21.07
5807	11.67	8.47	3.34	11.81	.50	1.39	1.52	20.92
5808	11.65	7.78	2.74	10.52	.63	1.79	1.71	21.22
5809	11.73	7.39	2.52	9.91	.75	1.91	1.85	21.13
5810	11.69	8.01	2.49	10.50	.67	1.80	1.86	21.41
	11.35	**7.93**	**2.69**	**10.62**	**.72**	**1.71**	**1.80**	**21.13**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*1.50*	*19.90*
5145	11.73	8.06	2.39	10.45	.99	1.79	1.89	21.35
5811	10.92	7.85	2.41	10.26	.43	1.88	1.93	21.52
5812	16.62	8.99	3.11	12.10	.77	1.26	1.61	20.86
	13.09	**8.30**	**2.64**	**10.94**	**.73**	**1.64**	**1.81**	**21.24**
		8.00	*2.00*	*10.00*	*1.00*	*1.65*	*1.50*	*19.90*
5104	7.62	8.83	4.88	13.71	3.04			14.59
5105	10.40	13.97	1.74	15.71	3.21			17.11
5813	10.38	10.29	5.04	15.33	1.93			16.36
5814	8.95	6.22	7.45	13.67	3.22			14.29
5815	8.83	7.34	7.34	14.68	2.67			15.41
	9.24	**9.33**	**5.29**	**14.62**	**2.81**			**15.55**
		9.00	*3.00*	*12.00*	*2.00*			*12.90*
5106	9.66	10.17	2.69	12.86	3.01			13.88
5192	12.78	7.06	4.34	11.40	4.80			12.11
5816	7.89	10.67	4.78	15.45	1.60			16.52
	10.11	**9.30**	**3.94**	**13.24**	**3.14**			**14.17**
		10.00	*2.00*	*12.00*	*2.00*			*13.00*
5354	10.94	11.90	3.33	15.23	1.73			16.42
5817	7.60	10.26	5.88	16.14	1.28			17.17
5818	12.13	8.92	6.80	15.72	.35			16.61
	10.22	**10.36**	**5.34**	**15.70**	**1.12**			**16.73**
		12.00	*2.00*	*14.00*	*2.00*			*15.20*
5356	10.45	7.48	2.29	9.77	1.22	1.84	2.49	21.35
5433	12.00	7.89	3.14	11.03	1.93	1.49	1.96	20.84
5822	11.29	7.74	2.49	10.23	.86	1.57	1.54	19.85
5823	8.61	7.43	3.27	10.70	2.99	1.43	1.36	19.59

Laboratory Number.	Name of Brand and Manufacturer.	When and from Whom Collected.
5824	S. G. Mobile Double Eagle Guano	Seward & Co., Ackerman
5825	S. G. Mobile Double Eagle Guano	W. M. Carstarphen, Bolton
		Average
		Guarantee
5107	S.G.Mobile Standard Guano	W. W. Harris & Son, Iuka
5108	S.G.Mobile Standard Guano	Meyer Bros., Meridian
5357	S.G.Mobile Standard Guano	T. L. Shots, Amory
5826	S.G.Mobile Standard Guano	R. A. Howard, Morton
		Average
		Guarantee
5355	S. G. Royal Blood, Bone and Potash	Harpole & Marshall, Eupora
5819	S. G. Royal Blood, Bone and Potash	Williams & Freeman, Sandersville
5820	S. G. Royal Blood, Bone and Potash	McComb City Merc. Co., McComb City
5821	S. G. Royal Blood Bone and Potash	Gaddis, McLaurin & Co., Raymond
		Average
		Guarantee
5109	S. G. Royal Cotton Boll Guano	Winner, Klein & Co., Meridian
5146	S. G. Royal Cotton Boll Guano	Winner, Klein & Co., Meridian
		Average
		Guarantee
5110	S. G. Scott's Gossypium Phospho	Winner, Klein & Co., Meridian
5147	S. G. Scott's Gossypium Phospho	Winner, Klein & Co., Meridian
5193	S. G. Scott's Gossypium Phospho	Bennett Bros. & McMillin, Louisville
5358	S. G. Scott's Gossypium Phospho	W. H. Wood, Pontotoc
5359	S. G. Scott's Gossypium Phospho	Summit Merc. Co., Summit
5827	S. G. Scott's Gossypium Phospho	Rice & Jackson, Liberty
5828	S. G. Scott's Gossypium Phospho	T. S. Turner, Canton
5829	S. G. Scott's Gossypium Phospho	W. G. Travis & Co., Heidelberg
5830	S. G. Scott's Gossypium Phospho	S. S. Dale & Sons, Prentiss
5831	S. G. Scoott's Gssypium Phospho	Doyle Kervin, Collins
5832	S. G. Scott's Gossypium Phospho	Watts Merc. Co., Sandersville

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5824	10.46	8.20	3.00	11.20	1.18	1.86	1.76	22.34
5825	11.02	7.29	3.38	10.67	.69	1.77	1.59	21.14
	10.64	**7.67**	**2.93**	**10.60**	**1.48**	**1.66**	**1.78**	**20.85**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.90*
5107	9.46	6.49	3.63	10.12	1.65	1.87	2.38	21.64
5108	13.53	6.37	3.00	9.37	2.60	1.58	2.21	19.47
5357	7.63	5.73	4.05	9.78	2.11	1.87	2.97	21.78
5826	8.80	6.29	2.80	9.09	2.05	1.76	2.03	19.70
	9.86	**6.22**	**3.37**	**9.59**	**2.10**	**1.77**	**2.40**	**20.65**
		6.00	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*18.55*
5355	10.58	6.41	4.02	10.43	1.23	1.53	1.51	19.74
5819	12.90	5.68	4.45	10.13	2.97	1.34	1.78	18.85
5820	10.23	7.18	4.12	11.30	1.24	1.11	1.56	19.15
5821	13.60	5.56	3.69	9.25	2.35	1.38	1.50	17.75
	11.83	**6.21**	**4.07**	**10.28**	**1.95**	**1.34**	**1.59**	**18.87**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.90*
5109	10.95	6.38	3.80	10.18	1.01	1.39	2.17	19.57
5146	10.41	6.73	3.31	10.04	1.64	1.53	2.21	20.05
	10.68	**6.56**	**3.55**	**10.11**	**1.32**	**1.46**	**2.19**	**19.81**
		6.00	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*18.55*
5110	12.76	7.62	2.11	9.73	1.37	1.86	1.93	20.84
5147	12.88	8.24	3.09	11.33	.91	1.46	1.62	20.75
5193	12.40	8.55	1.96	10.51	2.83	1.67	2.05	21.15
5358	9.58	7.51	3.50	11.01	1.29	1.90	2.32	22.78
5359	10.71	7.13	2.61	9.74	1.19	1.86	2.51	21.38
5827	11.07	8.29	3.45	11.74	.22	1.54	1.40	21.30
5828	10.43	7.02	3.17	10.19	2.15	1.59	1.81	20.08
5829	12.19	7.37	3.64	11.01	.32	1.76	1.61	21.50
5830	10.76	8.10	2.52	10.62	2.15	1.75	1.93	21.42
5831	11.48	7.65	2.51	10.16	.86	1.64	1.89	20.39
5832	9.45	6.79	3.44	10.23	.83	1.72	1.71	20.52

Laboratory Number.	Name of Brand and Manufacturer.	Where and from Whom Collected.
5833	S. G. Scott's Gossypium Phospho	The Union Merc. Co., New Albany
5834	S. G. Scott's Gossypium Phospho	Wagner & Co., Water Valley
		Average
		Guarantee
5434	S. G. Scott's State Standard Guano	Bethany Merc. Co., Guntown
5835	S. G. Scott's Standard State Guano	W. D. Cook & Co., D'Lo
		Average
		Guarantee
5435	S. G. V. C. C. Stand. Guano	Bethany Merc. Co., Guntown
		Guarantee
5360	S. G. German Kainit	Spivey & Scarborough, Decatur
5836	S. G. German Kainit	S. H. Andrews, Enterprise
		Average
		Guarantee
	Wesson Cotton Oil & Fertizier Company, Wesson, Miss.	
5837	S.G.Mutual Friend Mixture	Wm. Atkinson & McDonald, Wesson
5838	S.G.Mutual Friend Mixture	Wesson Cotton Oil & Fert. Co., Wesson
5839	S.G.Mutual Friend Mixture	Wesson Cotton Oil & Fert. Co., Wesson
		Average
		Guarantee

Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton
		Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5833	9.95	8.26	2.79	11.05	.87	1.68	1.80	21.50
5834	11.21	7.64	3.66	11.30	1.36	1.60	1.59	21.18
	11.14	**7.71**	**2.96**	**10.67**	**1.26**	**1.69**	**1.86**	**21.13**
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.90*
5434	10.73	5.53	2.85	8.38	2.25	1.91	2.50	19.91
5835	9.16	5.58	3.41	8.99	2.60	1.74	2.31	19.72
	9.94	**5.56**	**3.13**	**8.69**	**2.42**	**1.83**	**2.41**	**19.81**
		6.00	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*18.55*
5435	11.36	5.64	2.61	8.25	2.38	1.82	2.51	19.43
		8.00	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.90*
5360	1.48						13.32	13.32
5836	1.05						13.62	13.62
	1.27						**13.47**	**13.47**
							12.00	*12.00*
5837	8.44	8.65	3.25	11.90	.79	1.78	1.92	23.00
5838	8.96	8.56	3.16	11.72	.69	1.91	1.67	23.06
5839	9.18	8.00	3.57	11.57	.75	1.80	1.74	22.47
	8.86	**8.40**	**3.33**	**11.73**	**.74**	**1.83**	**1.78**	**22.84**
		7.00	*2.00*	*9.00*	*1.00*	*1.65*	*2.00*	*19.20*

TABLE III—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 19 5-06.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent	Insoluble Per Cent.			
	ALABAMA CHEMICAL COMPANY, Montgomery, Ala.									
4906	Rex H. G. Dissolved Bone	4906	9.95	13.23	2.40	15.63	.92			$16.95
	Guarantee			*11.00*	*3.00*	*14.00*	*2.00*			*15.10*
4907	Big Boll H. G. Acid Potash	4907	12.60	11.41	3.14	14.55	.86		1.47	18.62
	Guarantee			*10.00*	*3.00*	*13.00*	*2.00*		*1.00*	*16.30*
4908	Excelsior S. G. Acid Potash	4908	12.60	9.75	3.24	12.99	.59		1.33	16.59
	Guarantee			*8.00*	*3.00*	*11.00*	*2.00*		*1.00*	*13 90*
4909	Big Boll H. G. Guano	4909	10.70	8.78	2.96	11.74	1.06	1.30	3.79	22.78
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*.82*	*3.00*	*18 08*
4910	Excelsior H. G. Guano	4910	15.53	10.94	2.97	13.91	.62	1.15	3.19	24.19
	Guarantee			*9.00*	*3.00*	*12.00*	*2.00*	*.82*	*2.50*	*19.88*
4911	Liberty Bell S. G. Guano	4911	8.35	6.85	3.78	10.63	.72	1.66	3.62	22.64
	Guarantee			*6.00*	*2.00*	*8.00*	*2.00*	*1.65*	*2.00*	*18.00*
4912	Southern Cross H. G. Guano	4912	12.28	8.72	2.70	11.42	.95	2.18	3.08	25.23
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*20.40*
5045	S. G. Success Mixture	5045	10.50	8.17	2.43	10.60	.69	1.74	1.88	20.45
	Guarantee			*8.00*	*1.50*	*9.50*	*2.00*	*1.65*	*1.50*	*19.35*
	AMERICAN GUANO COMPANY, Nashville, Tennessee.									
5249	S. G. Mule Brand Acid Phosphate	5249	9.77	8.44	5.24	13.64	1.58			14.52
	Guarantee			*8.00*	*4.00*	*12.00*	*2.00*			*12.80*
5250	H. G. Mule Brand Dissolved Bone	5250	10.87	10.42	5.56	15.98	1.36			17.02
	Guarantee			*9.00*	*5.00*	*14.00*	*2.00*			*14.90*
5251	S. G. Mule Brand Blood and Bone	5251	6.25	4.78	4.56	9.34	4.16	1.50	1.64	18.39
	Guarantee			*6.00*	*3.00*	*9.00*	*2.00*	*1.65*	*1.00*	*18.10*
5252	S. G. Mule Brand Bourland's Cotton Grower	5252	4.92	4.20	4.23	8.43	3.63	1.52	3.59	19.36
	Guarantee			*5.50*	*2.50*	*8.00*	*1.00*	*1.65*	*3.00*	*18.95*

5253	S. G. Mule Brand Cotton, Corn and Wheat Guano	5253	8.40	5.32	3.03	8.35	1.16	1.65	3.26	19.58
	Guarantee			*5.00*	*3.00*	*8.00*	*2.00*	*1.65*	*2.00*	*17.90*
	ARMOUR FERTILIZER WORKS, Atlanta, Ga.									
5050	Shield Brand H. G. Armour's Superphosphate	5050	8.60	12.34	1.28	13.62	.26			14.85
	Guarantee			*10.00*	*4.00*	*14.00*	*1.00*			*15.00*
5051	Shield Brand S. G. Armour's Superphosphate	5051	6.48	9.67	3.01	12.66	.29			13.63
	Guarantee			*10.00*	*2.00*	*12.00*	*1.00*			*13.00*
5052	Shied Brand H. G. Am. Dissolved Bone and Potash	5052	7.75	6.97	3.31	10.28	.21	1.69	2.14	20.91
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*20.40*
5068	Shield Brand Armour's H. G. Dried Blood	5068	8.25					12.40		49.60
	Guarantee							*13.50*		*54.00*
5053	Shield Brand S. G. King Cotton	5053	6.20	6.64	2.40	9.04	.46	1.66	2.05	19.30
	Guarantee			*6.00*	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*18.00*
5054	Shield Brand H. G. Superphosphate and Potash	5054	8.72	6.86	3.83	10.69	.21		4.35	16.80
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*		*4.00*	*15.80*
5055	Shield Brand S. G. Superphosphate and Potash	5055	8.88	6.57	3.55	10.12	.16		2.36	14.15
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*		*2.00*	*13.80*
5056	Helmet Brand S. G. Fertilizer No. 282	5056	5.90	6.66	2.14	8.80	.39	1.69	2.02	19.13
	Guarantee			*6.50*	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*18.05*
5057	Shield Brand S. G. German Kainit	5057	1.03						12.23	12.23
	Guarantee								*12.00*	*12.00*
	BIRMINGHAM FERTILIZER COMPANY, Birmingham, Ala.									
4929	Monarch H. G. Acid Phosphate	4929	9.62	8.70	5.82	14.52	.83			15.39
4932	Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*
	Birmingham H. G. Fertilizer	4932	9.75	6.37	4.50	10.87	.67	1.69	2.41	21.76
5482	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*20.40*
	Birmingham S. G. Fertilizer	5482	5.20	5.29	4.20	9.49	.34	1.74	2.15	20.08
5513	Guarantee			*6.00*	*2.00*	*8.00*	*2.00*	*1.65*	*2.00*	*18.60*
	Monarch S. G. Blood and Bone	5513	9.08	6.88	4.20	11.08	2.06	1.99	1.60	22.44
4933	Guarantee			*7.50*	*2.00*	*9.50*	*2.00*	*1.65*	*1.50*	*19.30*
	Monarch S. G. Meal Mixture	4933	8.91	6.09	4.58	10.67	.64	1.71	2.54	21.73
5483	Guarantee			*7.50*	*2.00*	*9.50*	*2.00*	*1.65*	*1.50*	*19.30*
	Monarch H. G. Truck Fertilizer	5483	5.05	4.94	3.42	8.36	1.83	2.60	4.79	24.88
	Guarantee			*6.00*	*2.00*	*8.00*	*2.00*	*2.46*	*5.00*	*24.28*
	BROOKHAVEN PROGRESSIVE COTTON OIL CO., Brookhaven, Miss.									
5367	Brookhaven Choice S. G. Am. Bone and Potash	5367	3.63	6.19	4.05	10.24	2.42	1.79	1.84	20.88
	Guarantee			*6.00*	*2.25*	*8.25*	*1.00*	*1.65*	*2.25*	*18.53*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1905-1906.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5170	Brookhaven H. G. Special Mixture	5170	5.58	6.99	4.32	11.31	.60	1.75	2.21	$22.35
	Guarantee			*7.00*	*3.00*	*10.00*	*1.00*	*1.65*	*2.00*	*20.30*
5259	S. G. New South	5259	6.04	5.34	6.39	11.73	.53	1.81	2.29	22.97
	Guarantee			*5.50*	*2.50*	*8.00*	*1.00*	*1.65*	*2.00*	*17.95*
	CANTON OIL MILL COMPANY, Canton, Miss.									
5506	H. G. Acid Phosphate	5506	5.61	12.44	4.92	17.36	1.18			18.60
	Guarantee			*11.00*	*4.00*	*15.00*	*1.00*			*16.10*
5507	S. G. Madison	5507	12.90	9.58	3.87	13.45	.15		2.27	18.02
	Guarantee			*9.50*	*2.50*	*12.00*	*1.00*		*2.00*	*16.15*
5508	S. G. Paragan	5508	6.60	6.71	2.81	9.52	1.03	2.39	2.25	22.95
	Guarantee			*6.00*	*2.50*	*8.50*	*1.50*	*2.06*	*2.00*	*20.19*
	CAPITAL FERTILIZER & M'F'G COMPANY, Jackson, Miss.									
5880	H. G. Acid Phosphate	5880	6.95	12.51	1.81	14.32	.17			15.57
	Guarantee			*10.00*	*4.00*	*14.00*	*1.00*			*15.00*
4935	S. G. Acid Phosphate	4935	10.15	7.77	4.66	12.43	.90			13.21
	Guarantee			*10.00*	*2.00*	*12.00*	*1.00*			*13.00*
4936	H. G. Bone Meal	4936	4.07				22.43	4.16		27.86
	Guarantee						*25.00*	*2.50*		*22.50*
4937	S. G. Cotton Elevator	4937	10.20	5.66	3.48	9.14	.67	1.70	2.30	19.72
	Guarantee			*6.50*	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*18.05*
4938	S. G. Nonpariel	4938	10.70	5.64	3.52	9.16	.65	1.69	2.29	19.69
	Guarantee			*6.50*	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*18.05*
4939	S. G. Red Star Brand	4939	10.95	5.38	2.94	8.32	1.52	1.78	2.24	19.05
	Guarantee			*6.50*	*1.50*	*8.00*	*1.00*	*1.65*	*2.00*	*18.05*
4940	H. G. Vegetable Grower	4940	8.25	4.14	2.35	6.49	1.41	2.59	6.02	23.93
	Guarantee			*5.00*	*2.00*	*7.00*	*1.00*	*2.50*	*4.00*	*22.20*

4941	S. G. German Kainit	4941	3.45						14.71	$14.71
	Guarantee								*12.00*	*12.00*
	CLINTON OIL & M'F'G COMPANY, Clinton, La.									
5505	S. G. Comcos	5505	7.25	7.38	2.63	10.01	.57	1.43	2.18	19.65
	Guarantee			*6.00*	*2.00*	*8.00*	*.05*	*1.65*	*2.00*	*18.00*
	CONTINENTAL FERTILIZER COMPANY, Nashville, Tenn.									
5247	S. G. Sunny South Acid Phosphate	5247	7.75	8.03	3.70	11.73	1.26			12.53
	Guarantee			*8.00*	*5.00*	*13.00*	*1.00*			*13.80*
5248	S. G. Eddystone Soluble-Guano	5248	8.00	5.77	3.12	8.89	1.23	1.99	.86	19.18
	Guarantee			*6.00*	*3.00*	*9.00*	*1.00*	*1.65*	*1.00*	*18.10*
	CRYSTAL SPR'GS OIL MILL, FERT.& M'F'G CO., Crystal Sp'gs,Miss.									
5381	H. G. Superphosphate	5381	7.65	11.71	4.54	16.25	.64			17.42
	Guarantee			*10.25*	*5.25*	*15.50*	*1.00*			*16.53*
5122	S. G. Crystal Star	5122	14.40	5.90	2.54	8.44	.47	2.00	3.53	21.40
	Guarantee			*6.50*	*2.50*	*9.00*	*1.00*	*1.70*	*1.90*	*19.25*
5256	H. G. Crystal Springs Vegetable Grower	5256	9.90	4.25	3.00	7.25	.12	3.11	5.94	26.78
	Guarantee			*3.00*	*3.00*	*6.00*	*1.00*	*3.00*	*4.00*	*22.90*
5254	S. G. L. & H.'s Cotton Fertilizer	5254	9.63	6.13	2.88	9.01	.24	2.05	2.54	21.26
	Guarantee			*6.50*	*1.50*	*8.00*	*1.00*	*1.75*	*2.00*	*18.45*
5255	H. G. L. &. H.'s Vegetable Fertilizer	5255	5.73	4.67	3.06	7.73	.17	3.18	5.10	26.79
	Guarantee			*4.00*	*1.00*	*5.00*	*1.00*	*3.00*	*5.00*	*22.90*
5382	S. G. German Kainit	5382	4.25						11.93	11.93
	Guarantee								*12.00*	*12.00*
	EAGLE COTTON OIL CO., Meridian, Miss.									
5266	Eagle H. G. Acid Phosphate	5266	12.50	9.39	3.87	13.26	1.86			14.20
	Guarantee			*10.00*	*4.00*	*14.00*	*1.00*			*15.00*
5267	H. G. Farm Mixture	5267	11.20	7.17	3.45	10.62	1.30	1.88	2.76	22.68
	Guarantee			*7.50*	*2.50*	*10.00*		*1.65*	*2.00*	*20.35*
5268	S. G. Farm Mixture	5268	10.50	5.38	2.88	8.26	1.14	1.91	2.68	19.94
	Guarantee			*6.00*	*2.00*	*8.00*		*1.65*	*2.00*	*18.00*
5269	S. G. German Kainit	5269	1.90						12.82	12.82
	Guarantee								*12.00*	*12.00*
	FEDERAL CHEMICAL COMPANY, Louisville, Ky. MARKS & GAYLE, Division Managers, Montgomery, Ala.									
5270	Daybreak Pure H. G. Acid Phosphate	5270	8.80	11.38	3.90	15.28	3.66			16.42
	Guarantee			*10.00*	*4.00*	*14.00*	*1.00*			*15.00*
5271	Daybreak Pure H. G. Acid Phosphate No. 2	5271	13.15	12.30	4.25	16.55	1.35			17.78
	Guarantee			*10.67*	*5.33*	*16.00*	*1.00*			*17.07*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1905-1906.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5272	Daybreak Pure H. G. Acid Phosphate with Potash, No. 3	5272	8.45	8.03	4.86	12.89	5.42		5.74	$20.72
	Guarantee			*6.67*	*3.33*	*10.00*	*1.00*		*4.00*	*15.67*
5273	Daybreak Pure S. G. Acid Phosphate, with Potash, No. 2	5273	9.56	8.25	5.45	13.70	6.56		2.69	18.59
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*		*2.00*	*13.80*
5274	S. G. Daybreak Fertilizer	5274	9.70	8.16	3.77	11.93	4.56	1.75	2.42	23.36
	Guarantee			*5.33*	*2.67*	*8.00*	*1.00*	*1.65*	*2.00*	*17.93*
5275	H. G. Daybreak Fertilizer "A 1"	5275	10.68	11.42	4.34	15.76	.97	1.05	2.48	25.16
	Guarantee			*8.67*	*4.33*	*13.00*	*1.00*	*.82*	*2.00*	*20.45*
5276	S. G. Daybreak Fertilizer "AA"	5276	11.15	10.70	4.35	15.05	.84	1.28	2.42	15.17
	Guarantee			*7.33*	*3.67*	*11.00*	*1.00*	*.82*	*2.00*	*18.11*
5277	H. G. The Complete Fertilizer	5277	9.85	10.15	3.92	14.07	1.80	1.41	2.42	24.55
	Guarantee			*6.67*	*3.33*	*10.00*	*1.00*	*1.65*	*2.00*	*20.27*
5925	S. G. German Kainit	5925	1.01						12.43	12.43
	Guarantee								*12.00*	*12.00*
	GULFPORT COTTON OIL, FERTILIZER & M'F'G CO., Gulfport, Miss.									
5158	Primo H. G. Acid Phosphate	5158	12.37	16.49	2.08	18.57	.05			20.22
	Guarantee			*12.00*	*2.00*	*14.00*	*1.00*			*15.20*
5159	Primo S. G. Acid Phosphate	5159	10.40	11.73	2.18	13.91	.09			15.08
	Guarantee			*10.00*	*2.00*	*12.00*	*1.00*			*13.00*
5160	Primo H. G. Blood and Bone	5160	7.70	8.04	4.05	12.09	3.33	1.62	2.35	22.93
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*20.40*
4893	Primo S. G. Cotton and Corn	4893	7.41	5.87	3.73	9.60	2.75	1.78	2.11	20.38
	Guarantee			*6.00*	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*18.00*
4894	Primo S. G. Cottonseed Meal Compound	4894	9.88	6.01	2.65	8.66	.81	1.69	2.21	19.10
	Guarantee			*6.00*	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*18.00*

5258	Primo H. G. Cottonseed Meal Mixture	5258	10.13	7.24	3.39	10.63	1.44	1.77	2.61	$22.11
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*20.40*
4930	Primo S. G. Lawn Mixture	4930	5.95	4.12	1.15	5.27	.43	6.84	2.47	36.04
	Guarantee			*4.00*	*1.00*	*5.00*	*1.00*	*5.00*	*2.00*	*27.90*
4895	Primo S. G. R. B. Superphosphate	4895	8.05	4.95	3.80	8.75	2.08	1.64	2.40	19.08
	Guarantee			*6.00*	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*18.00*
5067	Primo H. G. Raw Ground Bone	5067	3.77				24.24	3.20		24.92
	Guarantee						*20.00*	*3.00*		*22.00*
4931	Primo H. G. Strawberry Compound	4931	6.00	4.31	1.78	6.09	.46	3.22	8.31	28.32
	Guarantee			*5.00*	*1.00*	*6.00*	*1.00*	*3.00*	*5.00*	*24.10*
4896	Primo H. G. Vegetable Fertilizer	4896	6.17	4.45	1.73	6.18	.59	3.19	5.93	25.93
	Guarantee			*5.00*	*1.00*	*6.00*	*1.00*	*3.00*	*5.00*	*24.10*
5161	Primo S. G. German Kainit	5161	.95						12.98	12.98
	Guarantee								*12.00*	*12.00*
	HAZLEHURST OIL MILL & FERTILIZER CO., Hazlehurst, Miss.									
4857	H. G. Acid Phosphate	4857	8.69	10.86	7.39	18.25	.97			19.34
	Guarantee			*12.00*	*2.00*	*14.00*	*1.00*			*15.20*
4858	S. G. Imperial Fertilizer	4858	5.92	7.03	3.78	10.81	.64	1.66	2.94	22.17
	Guarantee			*7.50*	*2.00*	*9.50*	*1.00*	*1.65*	*1.75*	*19.55*
5383	H. G. Imperial Vegetable Grower	5383	7.65	3.69	2.98	6.67	.68	2.67	3.97	22.36
	Guarantee			*5.00*	*2.00*	*7.00*	*1.00*	*2.50*	*3.00*	*21.20*
4859	S. G. German Kainit	4859	1.80						13.50	13.50
	Guarantee								*12.00*	*12.00*
	JACKSON FERTILIZER COMPANY, Jackson, Miss.									
4974	H. G. Acid Phosphate	4974	10.21	15.03	1.45	16.68	.86			18.18
	Guarantee			*12.00*	*2.00*	*14.00*	*1.00*			*15.20*
5535	S. G. Black Hawk Acid Phosphate	5535	10.14	9.84	4.39	14.23	1.67			15.21
	Guarantee			*10.00*	*2.00*	*12.00*	*1.00*			*13.00*
5112	H. G. Bone Meal	5112	4.45				21.47	2.60		21.14
	Guarantee						*22.90*	*2.47*		*21.33*
4975	S. G. Chicago R. B. Superphosphate	4975	6.03	5.41	3.81	9.22	2.77	2.05	2.28	21.16
	Guarantee			*7.50*	*2.00*	*9.50*	*1.00*	*1.65*	*1.50*	*19.30*
4976	H. G. Fruit and Vegetable Fertilizer	4976	8.17	5.43	1.29	6.72	.40	2.71	4.76	23.54
	Guarantee			*3.00*	*3.00*	*6.00*	*1.00*	*3.00*	*4.00*	*22.90*
4977	S. G. Gulf States Guano	4977	11.25	9.80	2.45	12.25	.59	1.40	1.98	22.04
	Guarantee			*7.50*	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*19.60*
4978	S. G. Lampton's R. B. Superphosphate	4978	6.90	5.57	3.50	9.07	2.81	2.00	2.30	20.83
	Guarantee			*7.50*	*2.00*	*9.50*	*1.00*	*1.65*	*1.50*	*19.30*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1905-1906.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5384	H. G. L. & H.'s Special Fertilizer	5384	10.14	5.24	2.88	8.12	2.21	2.51	4.95	$24.45
	Guarantee			*6.00*	*2.00*	*8.00*	*1.00*	*2.40*	*3.40*	*22.40*
4979	S. G. Royal "C" Brand	4979	10.87	9.89	2.44	12.33	.58	1.40	1.95	22.10
	Guarantee			*7.50*	*2.00*	*9.50*	*1.00*	*1.65*	*1.80*	*19.60*
4980	S. G. German Kainit	4980	1.09						12.71	12.71
	Guarantee								*12.00*	*12.00*
	Jefferson Gin & Oil Mill, Harriston, Miss.									
5279	H. G. Fortuna	5279	5.75	8.18	3.69	11.87	1.25	2.89		25.44
	Guarantee			*8.00*	*2.00*	*10.00*	*.80*	*2.45*		*21.60*
5280	Jefferson S. G. Fertilizer	5280	13.45	6.07	3.83	9.90	.80	1.50	2.02	19.52
	Guarantee			*6.75*	*2.25*	*9.00*	*.55*	*1.65*	*1.75*	*18.93*
	Kosciusko Oil Mill & Fertilizer Co., Kosciusko, Miss.									
5062	H. G. Acid Phosphate	5062	10.10	13.74	4.72	18.46	1.33			19.83
	Guarantee			*11.00*	*3.00*	*14.00*	*1.00*			*15.10*
5063	S. G. Peerless Guano	5063	10.20	6.97	4.04	11.01	.94	1.68	2.28	21.81
	Guarantee			*8.00*	*1.50*	*9.50*	*1.00*	*1.67*	*1.75*	*19.68*
5500	S. G. German Kainit	5500	.88						12.39	12.39
	Guarantee								*12.00*	*12.00*
	Laurel Oil & Fertilizer Company, Laurel, Miss.									
5511	H. G. Acid Phosphate	5511	6.50	12.39	4.18	16.57	.73			17.81
	Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*
5011	S. G. Acid Phosphate	5011	11.43	10.44	2.62	13.06	3.47			14.10
	Guarantee			*10.00*	*2.00*	*12.00*	*3.00*			*13.00*
5121	S. G. K. C. Ammoniated Bone	5121	11.21	8.83	2.32	11.15	.85	1.32	2.32	20.75
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.00*	*2.00*	*17.80*

5260	Laurel H. G. Special Fertilizer	5260	10.00	4.98	2.29	7.27	.84	3.21	5.46	$26.80
	Guarantee			*4.00*	*2.00*	*6.00*	*1.50*	*3.00*	*4.00*	*23.00*
5012	S. G. Plow Brand	5012	10.35	8.83	2.29	11.12	.83	1.96	2.08	23.04
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.80*	*1.50*	*19.30*
5261	S. G. German Kainit	5261	3.97						12.51	12.51
	Guarantee								*12.00*	*12.00*
	MARBACH & EAGAN, Crystal Springs, Miss.									
5380	Bat Guano	5380	10.65				8.46	5.87	1.82	29.53
	Guarantee						*5.00*	*4.25*	*.65*	*20.15*
	MCMILLAN & HARRISON, Mobile, Ala.									
5496	S. G. Perfection Guano	5496	9.40	6.75	3.28	10.03	.84	2.31	3.13	24.08
	Guarantee			*6.00*	*2.00*	*8.00*	*1.50*	*2.50*	*2.50*	*21.90*
	P. B. MATHISON M'F'G COMPANY, St. Louis, Mo.									
5257	H. G. Increscent Brand Dissolved Bone	5257	7.60	6.67	.42	7.09	1.86	2.63	5.31	24.30
	Guarantee			*6.00*	*3.00*	*9.00*	*2.00*	*3.00*	*4.00*	*26.50*
5378	S. G. Increscent Brand Ark. Cotton and Corn Guano	5378	9.85	1.44	5.86	7.30	4.81	1.92	1.95	17.80
	Guarantee			*5.00*	*3.00*	*8.00*	*2.00*	*1.66*	*2.00*	*17.94*
5379	H. G. Increscent Brand Southern Special	5379	8.29	5.04	5.91	10.95	3.18	2.21	2.17	23.56
	Guarantee			*6.00*	*3.00*	*9.00*	*3.00*	*2.47*	*2.00*	*22.38*
	MERIDIAN FERTILIZER FACTORY, Meridian, Miss.									
4953	S. G. Meridian English Acid Phosphate	4953	13.89	9.31	5.72	15.03	1.14			15.96
	Guarantee			*10.00*	*2.00*	*12.00*	*1.00*			*13.00*
4954	H. G. Meridian Southern Acid Phosphate	4954	13.87	10.75	3.53	14.28	.72			15.36
	Guarantee			*12.00*	*2.00*	*14.00*	*1.00*			*15.20*
4955	S. G. Meridian Blood and Bone	4955	12.74	7.21	3.29	10.50	3.13	2.10	2.23	22.90
	Guarantee			*8.00*	*1.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.35*
4956	S. G. Meridian Farmers Friend	4956	11.39	7.90	3.73	11.63	.92	1.77	2.63	23.29
	Guarantee			*8.00*	*1.50*	*9.50*	*1.00*	*1.64*	*1.50*	*19.31*
4957	S. G. Meridian Home Mixture	4957	11.99	8.15	3.20	11.35	.77	1.79	2.61	23.07
	Guarantee			*8.00*	*1.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.35*
4958	S. G. Meridian Soluble Guano	4958	12.48	8.34	1.80	10.14	2.59	1.81	2.20	21.43
	Guarantee			*8.00*	*1.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.35*
4959	H. G. Meridian Vegetable Grower	4959	11.51	6.19	2.86	9.05	1.70	2.62	5.06	26.11
	Guarantee			*6.00*	*2.00*	*8.00*	*1.00*	*2.50*	*5.00*	*24.40*
4960	S. G. Hattiesburg Am. Mixture with Bone	4960	12.72	8.10	3.16	11.26	.98	1.80	2.21	22.61
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*	*1.65*	*1.00*	*19.40*
4961	S. G. Meridian German Kainit	4961	.83						13.71	13.71
	Guarantee								*12.00*	*12.00*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1905-1906.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
	NEW ORLEANS ACID & FERTILIZER CO., New Orleans, La.									
5390	H. G. Acid Phosphate	5390	10.78	11.67	3.42	15.09	.49			$16.26
	Guarantee			*12.00*	*4.00*	*16.00*	*2.00*			*17.20*
5013	S. G. Black Diamond Acid Phosphate	5013	5.88	10.49	3.51	14.00	.52			15.03
	Guarantee			*10.00*	*2.00*	*12.00*	*2.00*			*13.00*
5014	S. G. Crescent City Acid Phosphate	5014	4.58	8.41	4.32	12.73	.62			13.57
	Guarantee			*10.00*	*2.00*	*12.00*	*2.00*			*13.00*
5485	S. G. Ammoniated R. B. Superphosphate and Potash	5485	8.65	4.64	4.64	9.28	.49	2.01	1.78	20.49
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.50*	*18.70*
5015	S. G. Blood, Bone and Beef	5015	8.17	5.11	4.26	9.37	.69	2.05	2.00	21.02
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.50*	*18.70*
5016	S. G. Blood, Bone and Potash	5016	8.05	5.12	4.05	9.17	.68	2.01	2.00	20.64
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.50*	*18.70*
5017	S. G. Dissolved Bone and Potash	5017	15.22	6.22	3.68	9.90	.56		2.24	13.75
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*		*2.00*	*13.80*
5018	H. G. Economizer	5018	9.09	8.74	2.83	11.57	.24	1.87	2.46	23.54
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*20.40*
5019	S. G. Gold Dust	5019	13.21	7.72	2.15	9.87	.38	1.71	2.05	20.52
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.50*	*18.70*
5020	S. G. Goldsmith's Improved Mixture	5020	12.37	7.80	2.33	10.13	.33	1.69	1.90	20.58
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.50*	*18.70*
5021	S. G. Jack Gaston's Cotton and Corn	5021	12.78	7.68	2.25	9.93	.33	1.71	1.98	20.51
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.50*	*18.70*
5022	H. G. Vegetable Grower	5022	13.93	4.62	2.18	6.80	.20	2.59	4.08	22.38
	Guarantee			*4.00*	*2.00*	*6.00*	*2.00*	*2.47*	*4.00*	*20.88*

5023 S. G. German Kainit	5023	3.77							13.24	$13.24
Guarantee									*12.00*	*12.00*
NEWTON OIL & M'F'G COMPANY, Newton, Miss.										
5164 H. G. Acid Phosphate 16%	5164	9.23	10.56	7.66	18.22	.55				19.28
Guarantee			*14.00*	*2.00*	*16.00*	*1.00*				*17.40*
5165 H. G. Acid Phosphate 14%	5165	10.08	9.11	6.27	15.38	.69				16.29
Guarantee			*12.00*	*2.00*	*14.00*	*1.00*				*15.20*
5166 S. G. Acid Phosphate 12%	5166	8.20	7.16	5.86	13.02	.74				13.74
Guarantee			*10.00*	*2.00*	*12.00*	*1.00*				*13.00*
5167 S. G. Banner C. & C. Brand	5167	7.75	5.99	3.74	9.73	.50	1.79	2.47		20.93
Guarantee			*7.00*	*1.50*	*8.50*	*1.00*	*1.65*	*2.25*		*18.90*
5168 S. G. Pine Land Guano	5168	6.17	5.90	3.93	9.83	.45	1.92	2.22		21.30
Guarantee			*7.00*	*1.50*	*8.50*	*1.00*	*1.65*	*2.25*		*18.90*
PLANTERS FERTILIZER & CHEMICAL CO., New Orleans, La.										
5153 Planters S. G. Acid Phosphate	5153	8.98	8.93	5.26	14.19	1.31				15.08
Guarantee			*10.00*	*2.00*	*12.00*	*2.00*				*13.00*
5154 Planters S. G. Cotton and Corn No. 1	5154	12.84	7.40	3.13	10.53	.90	1.80	2.16		21.68
Guarantee			*7.00*	*2.50*	*9.50*	*2.00*	*1.65*	*1.50*		*19.25*
5155 Planters S. G. Golden Mixture	5155	13.60	7.54	2.88	10.42	.90	1.77	2.13		21.43
Guarantee			*7.50*	*2.00*	*9.50*	*2.00*	*1.65*	*1.50*		*19.30*
5499 Planters S. G. Magic Fertilizer	5499	7.98	6.97	4.09	11.06	1.44	1.66	1.97		21.47
Guarantee			*7.50*	*2.00*	*9.50*	*2.00*	*1.65*	*1.50*		*19.30*
5156 Planters S. G. R. B. Superphosphate	5156	11.92	6.15	3.05	9.20	1.34	1.64	1.63		18.93
Guarantee			*7.00*	*2.50*	*9.50*	*2.00*	*1.65*	*1.50*		*19.25*
5157 Planters H. G. Vegetable Grower	5157	12.64	5.84	1.71	7.55	2.01	2.37	4.77		23.14
Guarantee			*5.00*	*2.00*	*7.00*	*2.00*	*2.65*	*3.50*		*22.30*
5512 S. G. German Kainit	5512	1.93							12.35	12.35
Guarantee									*12.40*	*12.40*
REFUGE COTTON OIL COMPANY, Columbus, Miss.										
5521 Refuge H. G. Acid Phosphate	5521	8.60	11.41	4.64	16.05	1.31				17.19
Guarantee			*12.00*	*2.00*	*14.00*	*2.00*				*15.20*
5522 S. G. Columbus Home Made Fertilizer	5522	10.80	7.24	4.01	11.25	.90	1.28	1.73		19.95
Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*		*19.90*
5523 S. G. Refuge Standard Guano	5523	15.43	6.94	3.33	10.27	.91	1.35	2.69		20.08
Guarantee			*6.00*	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*		*18.55*
SHUBUTA OIL & M'F'G COMPANY, Shubuta, Miss.										
5263 H. G. Shubuta Acid Phosphate	5263	9.49	11.93	3.29	15.22	2.67				16.41
Guarantee			*10.00*	*4.00*	*14.00*	*1.00*				*15.00*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1905-1906.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5264	S. G. Shubuta Mixture	5264	8.23	7.21	2.42	9.63	1.96	1.86	2.11	$20.86
	Guarantee			*6.00*	*3.00*	*9.00*	*1.00*	*1.65*	*1.60*	*18.70*
5265	S. G. German Kainit	5265	2.28						12.52	12.52
	Guarantee								*12.00*	*12.00*
	SOUTHERN OIL & FERTILIZER COMPANY, Meridian, Miss.									
5985	Southern's S. G. Acid Phosphate	5985	14.68	8.47	5.18	13.65	2.02			14.50
	Guarantee			*9.00*	*3.00*	*12.00*	*2.00*			*12.90*
5986	Southern's 20th Century H. G. Acid Phosphate	5986	11.09	13.73	4.26	17.99	1.65			19.36
	Guarantee			*10.00*	*4.00*	*14.00*	*2.00*			*15.00*
5987	Southern's S. G. Cotton Grower	5987	11.60	5.39	3.82	9.21	1.15	1.72	1.87	19.42
	Guarantee			*6.00*	*3.00*	*9.00*	*1.00*	*1.65*	*1.00*	*18.10*
5988	Southern's S. G. Superior	5988	11.85	5.54	2.95	8.49	1.11	1.66	2.65	19.18
	Guarantee			*5.00*	*3.00*	*8.00*	*1.00*	*1.65*	*2.00*	*17.90*
5989	S. G. German Kainit	5989	2.00						12.54	12.54
	Guarantee								*12.00*	*12.00*
	STANDARD GUANO & CHEMICAL M'F'G CO., New Orleans, La.									
4981	H. G. Stern's Acid Phosphate	4981	11.40	12.12	5.29	17.41	.88			18.62
	Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*
4982	S. G. Stern's Acid Phosphate	4982	13.53	11.54	5.43	16.97	1.01			18.12
	Guarantee			*10.00*	*2.00*	*12.00*	*2.00*			*13.00*
4983	H. G. Dissolved Bone	4983	14.40	15.55	.61	16.16	.08			17.72
	Guarantee			*12.00*	*3.00*	*15.00*	*1.00*			*16.20*
4984	S. G. Blood, Bone and Meat	4984	12.49	6.96	3.88	10.84	2.10	1.72	1.65	21.15
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.25*
4985	S. G. Champion Farmers Choice	4985	11.43	6.69	3.27	9.96	1.84	1.62	1.30	19.41
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.65*	*1.00*	*18.75*

4986	H. G. Ground Bone and Potash	4986	7.14				16.77	2.93	3.48	$23.59
	Guarantee						*15.00*	*2.75*	*3.00*	*21.50*
4987	S. G. Mississippi Home Guano	4987	14.54	6.92	3.02	9.94	1.65	1.68	2.00	20.35
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.25*
4988	S. G. Pelican R. B. Guano	4988	12.45	7.06	3.86	10.92	2.27	1.68	1.62	21.06
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.25*
4989	H. G. Pure Raw Ground Bone	4989	5.53				24.56	2.98		24.20
	Guarantee						*18.50*	*2.50*		*19.25*
4990	S. G. Stern's Am. R. B. Superphosphate	4990	12.68	7.15	3.65	10.80	2.28	1.75	1.71	21.31
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.25*
4991	S. G. Standard Am. Soluble Guano	4991	12.52	7.33	3.57	10.90	2.24	1.70	1.67	21.19
	Guarantee			*7.00*	*2.50*	*9.50*	*1.00*	*1.65*	*1.50*	*19.25*
4992	Standard H. G. Truck Grower	4992	6.28	7.19	2.07	9.26	1.03	3.50	7.46	32.37
	Guarantee			*6.00*	*2.00*	*8.00*	*2.00*	*3.50*	*7.00*	*30.40*
4993	H. G. Sugar Fertilizer	4993	7.99	7.30	3.63	10.93	1.91	2.36	2.41	24.60
	Guarantee			*8.50*	*1.50*	*10.00*	*1.00*	*2.50*	*2.00*	*23.85*
4994	H. G. Vegetable Fertilizer	4994	7.28	4.35	3.26	7.61	.91	3.21	5.02	26.67
	Guarantee			*5.00*	*1.00*	*6.00*	*1.00*	*3.00*	*5.00*	*24.10*
4995	S. G. German Kainit	4995	2.10						13.94	13.94
	Guarantee								*12.00*	*12.00*
	SWIFT'S FERTILIZER WORKS, Atlanta, Ga.									
4917	Swift's S. G. Chattahoochee Acid Phosphate	4917	7.82	9.21	3.74	12.95	.32			13.87
	Guarantee			*7.00*	*5.00*	*12.00*	*1.50*			*12.70*
4918	Swift's H. G. Cultivator Acid Phosphate	4918	10.15	12.34	2.93	15.27	.17			16.50
	Guarantee			*9.00*	*5.00*	*14.00*	*1.50*			*14.90*
4919	Swift's Cotton King H. G. Guano	4919	7.72	6.75	2.94	9.69	1.58	3.25	2.56	26.89
	Guarantee			*6.00*	*3.00*	*9.00*	*1.50*	*2.47*	*2.00*	*22.38*
4920	Swift's Cotton Plant S. G. Guano	4920	6.67	7.63	2.47	10.10	.88	1.93	1.35	20.94
	Guarantee			*6.00*	*3.00*	*9.00*	*1.50*	*1.65*	*1.00*	*18.10*
4921	Swift's Eagle H. G. Guano	4921	7.60	8.81	5.29	14.10	.81	1.79	2.98	26.53
	Guarantee			*6.50*	*3.50*	*10.00*	*1.50*	*1.65*	*2.00*	*20.25*
4922	Swift's Farmers Home H. G. Guano	4922	8.65	6.21	4.59	10.80	.42		4.02	16.52
	Guarantee			*6.00*	*4.00*	*10.00*	*1.50*		*4.00*	*15.60*
4923	Swift's Field and Farm S. G. Guano	4923	7.76	5.96	4.87	10.83	.44		2.24	14.75
	Guarantee			*6.00*	*4.00*	*10.00*	*1.50*		*2.00*	*13.60*
4924	Swift's Golden Harvest S. G. Guano	4924	6.87	5.95	2.59	8.54	1.11	1.92	2.69	20.27
	Guarantee			*5.50*	*2.50*	*8.00*	*1.50*	*1.65*	*2.00*	*17.95*
4925	Swift's Monarch H. G. Guano	4925	7.31	6.72	2.54	9.26	1.24	3.09	4.75	27.97
	Guarantee			*5.50*	*2.50*	*8.00*	*1.50*	*3.29*	*4.00*	*26.51*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1905-1906.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5281	Swift's Pure H. G. Bone Meal	5281	3.62				27.15	2.35		$22.98
	Guarantee						*23.00*	*2.47*		*21.38*
4926	Swift's Red Steer S. G. Guano	4926	6.82	6.16	2.44	8.60	1.10	1.89	2.63	20.27
	Guarantee			*5.50*	*2.50*	*8.00*	*1.50*	*1.65*	*2.00*	*17.95*
	TENNESSEE CHEMICAL COMPANY, Nashville, Tenn.									
5923	Ox H. G. Dissolved Bone	5923	12.80	11.11	4.55	15.66	1.32			16.77
	Guarantee			*8.00*	*6.00*	*14.00*	*1.00*			*14.80*
5541	Ox H. G. Ammoniated Bone	5541	6.30	2.74	7.30	10.04	8.36	2.21	1.62	21.78
	Guarantee			*6.00*	*4.00*	*10.00*	*1.00*	*1.65*	*2.00*	*20.20*
5542	Ox S. G. Cotton Guano	5542	8.64	7.29	3.67	10.96	1.24	1.89	1.01	21.36
	Guarantee			*6.00*	*4.00*	*10.00*	*1.00*	*1.65*	*1.00*	*19.20*
5543	Ox S. G. Potash Mixture	5543	8.55	5.39	5.13	10.52	.32		1.83	13.94
	Guarantee			*6.00*	*4.00*	*10.00*	*1.00*		*2.00*	*13.60*
5544	Ox S. G. Slaughter House Bone	5544	6.00	7.04	3.89	10.93	1.69	1.93	1.83	22.28
	Guarantee			*6.00*	*2.00*	*8.00*	*1.00*	*1.65*	*2.00*	*18.00*
	TENNESSEE VALLEY FERTILIZER CO., Florence, Ala.									
5385	S. G. Dissolved Bone	5385	6.10	8.09	3.51	11.60	3.86			12.41
	Guarantee			*10.00*	*2.00*	*12.00*	*2.00*			*13.00*
5386	Tiger H. G. Dissolved Bone	5386	8.50	9.02	3.93	12.95	3.47			13.85
	Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*
5387	S. G. Ashcraft's Formula	5387	13.75	4.97	5.64	10.61	1.65		1.90	14.07
	Guarantee			*8.47*	*2.00*	*10.47*	*2.00*		*2.19*	*14.58*
5389	S. G. King Cotton Grower	5389	10.79	5.15	2.62	7.77	2.41	1.88	2.05	18.62
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*18.20*
5388	H. G. Florence Fertilizer	5388	10.50	6.57	2.20	8.77	2.52	1.84	3.37	21.03
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*2.00*	*20.40*

	THREEFOOT BROS. & COMPANY, Meridian, Miss.									
4962	H. G. Threefoot's English Acid Phosphate	4962	12.53	10.52	6.67	17.19	.98			$18.24
	Guarantee			*13.00*	*2.00*	*15.00*	*1.00*			*16.30*
4963	S. G. Threefoot's Prolific Acid Phosphate	4963	14.77	9.38	5.30	14.68	1.41			15.62
	Guarantee			*11.00*	*2.00*	*13.00*	*1.00*			*14.10*
4964	S. G. Threefoot's Improved Mixture	4964	11.20	8.29	3.45	11.74	.94	1.74	2.22	22.92
	Guarantee			*7.50*	*2.00*	*9.50*	*1.00*	*1.64*	*1.60*	*19.36*
	TUPELO FERTILIZER FACTORY, Tupelo, Miss.									
5524	Cotton Belt H. G. Acid Phosphate	5524	7.65	13.26	2.70	15.96	.38			17.29
	Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*
5525	Cotton Belt S. G. Acid Phosphate	5525	7.13	10.47	2.02	12.49	.31			13.54
	Guarantee			*10.00*	*2.00*	*12.00*	*1.65*			*13.00*
5526	Cotton Belt S. G. Blood and Bone	5526	11.37	6.40	3.66	10.06	.85	1.81	2.27	21.22
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*	*1.65*	*1.50*	*19.90*
5527	Cotton Belt H. G. Fertilizer	5527	7.18	8.27	3.08	11.35	.11	1.78	2.22	22.65
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*	*1.65*	*2.00*	*20.40*
5528	Cotton Belt S. G. Fertilizer	5528	9.40	8.23	3.11	11.34	1.77	1.87	1.74	22.52
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*	*1.65*	*1.50*	*19.90*
5531	Cotton Belt S. G. Phosphate and Potash	5531	10.32	5.74	2.96	8.70	.34		4.11	14.25
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*		*2.00*	*13.80*
5529	Cotton Belt H. G. Vegetable Producer	5529	9.50	4.33	2.79	7.12	.79	1.94	4.31	20.34
	Guarantee			*4.00*	*2.00*	*6.00*	*1.00*	*2.47*	*5.00*	*21.88*
5530	Cotton Belt S. G. German Kainit	5530	1.50						12.51	12.51
	Guarantee								*12.00*	*12.00*
5532	Tupelo H. G. Acid Phosphate	5532	8.82	12.60	2.91	15.51	.29			16.77
	Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*
5533	Tupelo S. G. Fertilizer	5533	8.45	8.36	3.26	11.62	1.60	1.84	1.74	22.72
	Guarantee			*8.00*	*2.00*	*10.00*	*1.00*	*1.65*	*1.50*	*19.90*
5534	Tupelo S. G. German Kainit	5534	1.02						12.59	12.59
	Guarantee								*12.00*	*12.00*
	VIRGINIA-CAROLINA CHEMICAL COMPANY, Memphis, Tenn.									
4942	S. G. I. X. L. Acid Phosphate	4942	12.95	10.34	2.34	12.68	3.54			13.71
	Guarantee			*9.00*	*3.00*	*12.00*	*2.00*			*12.90*
5032	S. G. Royal Acid Phosphate	5032	11.25	9.35	3.50	12.85	2.20			13.79
	Guarantee			*10.00*	*2.00*	*12.00*	*2.00*			*13.00*
5033	Scott's H. G. Acid Phosphate	5033	9.57	10.40	4.59	14.99	.26			16.03
	Guarantee			*12.00*	*2.00*	*14.00*	*2.00*			*15.20*
5374	Virginia-Carolina H. G. Superphosphate	5374	13.85	10.92	5.97	16.89	.59			17.98
	Guarantee			*12.00*	*4.00*	*16.00*	*2.00*			*17.20*

TABLE III.—Analyses of Brands of Fertilizers Registered for Sale in the State, with Guarantees for Season 1905-1906.

Laboratory Number.	Name of Brand and Address of Manufacturer.	Laboratory Number.	Moisture—Per Cent.	Phosphoric Acid.				Nitrogen—Per Cent.	Potash—Per Cent.	Relative Value Per Ton.
				Water Soluble Per Cent.	Citrate Soluble Per Cent.	Available Per Cent.	Insoluble Per Cent.			
5551	S. G. Buchanan's Best	5551	9.63	7.85	3.20	11.05	1.19	1.90	1.95	$22.49
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.90*
5552	S. G. Eclipse Soluble Guano	5552	10.59	7.42	2.88	10.30	1.68	1.95	1.53	21.41
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*18.20*
5484	H. G. Memphis Truck Special	5484	8.88	4.01	3.37	7.38	3.28	3.82	4.64	28.44
	Guarantee			*5.00*	*2.00*	*7.00*	*2.00*	*3.30*	*4.00*	*25.40*
5034	S. G. Mobile Double Eagle Guano	5034	11.28	5.83	3.47	9.30	2.50	1.97	2.04	20.73
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.90*
5035	S. G. Mobile R. B. Am. Superphosphate	5035	12.05	6.87	4.60	11.47	1.45	1.92	1.83	22.81
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.90*
4943	S. G. Mobile Standard Guano	4943	11.45	5.64	3.51	9.15	3.63	1.92	2.64	20.95
	Guarantee			*6.00*	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*18.55*
5304	S. G. Owl Brand Guano	5304	12.29	6.97	3.31	10.28	1.24	2.06	1.41	21.66
	Guarantee			*7.00*	*2.00*	*9.00*	*2.00*	*1.65*	*1.00*	*18.20*
5036	S. G. Royal Blood, Bone and Potash	5036	11.85	6.88	4.50	11.38	1.40	1.89	1.81	22.58
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.90*
5037	S. G. Royal Compound	5037	13.18	5.99	3.80	9.79	2.09		2.38	13.75
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*		*2.00*	*13.80*
5038	S. G. Royal Cotton Boll Guano	5038	13.99	5.70	4.78	10.48	2.40	1.92	2.56	22.34
	Guarantee			*6.00*	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*18.55*
5049	H. G. Royal Potash Compound	5049	10.50	9.29	4.65	13.94	.49		4.54	20.80
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*		*4.00*	*15.80*
5375	H. G. Royal Vegetable Fertilizer	5375	12.35	5.23	3.97	9.20	1.25	2.62	4.04	25.16
	Guarantee			*6.00*	*2.00*	*8.00*	*2.00*	*2.47*	*4.00*	*23.28*
5376	S. G. Scott's Ammoniated Bone	5376	9.10	7.01	3.13	10.14	1.17	2.04	1.50	21.52
	Guarantee			*7.00*	*2.50*	*9.50*	*2.00*	*1.65*	*1.00*	*18.75*

5553	S. G. Scott's Gossypium Phospo	5553	12.10	7.23	3.07	10.30	1.66	1.93	1.58	$21.45
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.90*
5377	H. G. Scott's Potasso Phospho	5377	15.75	8.54	5.60	14.14	.47		2.27	18.68
	Guarantee			*9.00*	*3.00*	*12.00*	*2.00*		*2.00*	*16.10*
5039	S. G. Scott's State Standard Guano	5039	10.00	6.50	3.60	10.10	.52	1.97	2.65	22.29
	Guarantee			*6.00*	*2.50*	*8.50*	*2.00*	*1.65*	*2.00*	*18.55*
5373	S. G. V. C. C. Standard Guano	5373	10.20	5.91	3.48	9.39	2.46	1.95	1.97	20.69
	Guarantee			*8.00*	*2.00*	*10.00*	*2.00*	*1.65*	*1.50*	*19.90*
5040	S. G. German Kainit	5040	3.58						12.28	12.28
	Guarantee								*12.00*	*12.00*
	Wesson Cotton Oil & Fertilizer Company, Wesson, Miss.									
5539	S. G. Mutual Friend Mixture	5539	8.37	9.15	3.31	12.46	1.19	1.78	1.69	23.43
	Guarantee			*7.00*	*2.00*	*9.00*	*1.00*	*1.65*	*2.00*	*19.20*

Mississippi Agricultural Experiment Station.

BULLETIN NO. 98.

VARIETIES OF COTTON.

1905 and 1906.

By W R. PERKINS.

AGRICULTURAL COLLEGE, MISS.

January, 1907.

TUCKER PRINTING HOUSE, JACKSON, MISS

VARIETIES OF COTTON.

1905 and 1906.

W. R. PERKINS.

No report was published of the variety test of cotton for 1905. Owing to the date at which the ginning was done, it was deemed useless to make such a report too late to be of any service for the following year.

The results of the experiment for 1905 and those for 1906 are included in the following brief report.

The test of varieties has been conducted for the past four years on the same piece of land. The soil is of medium quality and varies from a light to a rather heavy loam in places.

No fertilizers of any kind have been used on the land during the four years except about ten loads of barnyard manure in the spring of 1905. This was spread over the poorer spots as a means of bringing all parts of the soil to a nearly uniform state of productiveness. Every precaution was taken to avoid any division of the land into plats that would give any variety of cotton an advantage over another in the way of being on better land. The varieties are always planted in one-row plats, and repeated a number of times, usually about ten times. Instead of one variety being grouped in one part of the field it is scattered regularly all over the area. In the test for 1906 every sixteenth row was in the same variety, there having been sixteen varieties planted. The tables following give full data as to yield, value of crops, etc.:

TABLE I.—VARIETIES OF COTTON, 1905.

Rank.	VARIETY.	Yield of Seed Cotton, Lbs. per A	Per Cent. Lint.	Yield of Lint, Lbs. per A	Yield of Seed, Lbs. per A.	Length Staple. INCHES.	Value per Acre.
1	Cook's Improved	1978	38.0	751.6	1226	$\frac{7}{8}$	$82.51
2	Toole's Early	1871	37.8	707.2	1164	$1\frac{1}{8}$	77.70
3	Layton's Improved	1683	37.6	632.8	1050	$\frac{3}{4}$	69.53
4	Truitt's	1811	33.4	604.8	1206	1 1–16	67.71
5	Lewis' Prize	1662	36.0	598.3	1064	1	66.21
6	Tatum's Improved	1806	32.5	586.9	1219	1 1–16	66.00
7	Excelsior	1800	32.5	585.0	1215	1 1–16	65.79
8	Russell's Big Boll	1903	30.3	576.6	1327	1 1–16	65.62
9	Moss' Improved	1408	42.6	599.6	808	$\frac{7}{8}$	64.80
10	Schley	1723	32.8	573.0	1150	1 1–16	64.20
11	King No. 1	1634	35.3	576.8	1057	$\frac{7}{8}$	64.02
12	Culpepper	1715	33.1	567.6	1147	1	63.84
13	Texas Burr	1613	33.3	537.6	1075	$\frac{7}{8}$	60.21
14	Hawkins	1585	33.5	530.9	1054	$\frac{7}{8}$	59.41
15	Herlong	1602	32.6	523.2	1079	1	58.79
16	Jones' Improved	1548	31.9	493.8	1054	1 1–16	55.70
17	Griffin—long staple	1542	32.4	*499.6	1042	$1\frac{3}{8}$	80.19
18	Cook—long staple	1343	33.0	*443.2	900	$1\frac{1}{2}$	71.98
19	Allen—long staple	1259	30.0	*377.7	881	$1\frac{1}{2}$	61.93
20	So. Hope	1715	30.3	†519.6	1195	$1\frac{1}{4}$	72.12

* 15 cents per lb. † $12\frac{1}{2}$ cents per lb.

TABLE II.—VARIETIES OF COTTON, 1906.

Rank.	VARIETY.	Yield of Seed Cotton Lbs. per A.	Per Cent. Lint.	Yield Lint, Lbs. per A.	Yield Seed Lbs. per A.	Length Staple INCHES.	Value.	No. Seed in 1 lb.	No. Bolls Cotton to make one lb.
1	Cook's Improved	1560	38.4	599.0	961	⅞	$65 66	3991	65
2	Cleveland Big Boll	1560	35.6	555.4	1004	1 1–16	61 56	3709	60
3	Eureka	1425	37.7	537.2	888	1	59 04	3846	73
4	Triumph	1480	35.9	531.3	949	1⅛	58 82	3718	59
5	Peterkin	1390	38.4	533.7	856	1 1–16	58 50	4199	77
6	Toole's Early	1325	40.7	539.2	786	1	58 41	5324	100
7	Prize	1405	36.5	512.8	892	1	56 63	4118	80
8	Moss' Improved	1220	42.1	513.6	706	1	55 59	4779	89
9	Tatum's Improved	1420	32.7	464.3	956	1 1–16	52 16	3449	61
10	Russell Big Boll	1456	31.8	463.0	993	1	51 25	3518	
11	Schley	1360	32.5	442.0	918	1	49 70	4217	
12	Excelsior	1235	33.6	414.9	820	1 1–16	46 41	4997	87
13	Griffin—long staple	1440	30.7	*443.3	1000	1¼	72 40	4117	73
14	Cook—long staple	1255	30.2	*379.0	876	1 7–16	62 10	4117	80
15	Allen—long staple	1261	29.7	*374.5	886	1½	61 48	4100	80
16	Southern Hope	1344	32.0	†430 0	914	1 5–16	59 23	4353	94

* 15 cents per lb.

† 12½ cents per lb.

In calculating the value of crop, short staple cotton is reckoned at 10 cents per pound, long staple at 15 cents, and one and one-fourth inch staple at 12½ cents per pound. Seed are calculated at 60 cents per hundred, or $12.00 per ton.

The price given to short-staple cotton represents fairly what it would have brought during either season, though a discriminating market might have made some small differences, due to varying length of staple. The long staple if anything would have brought more than 15 cents per pound, so that for the two past years, at least, the figures show about the differences existing in value.

The data in tables need little comment, further than to emphasize the care taken to prevent any conditions other than the difference in seed, entering as a modifier of the results, and to call attention to the fact that some varieties of cotton are much better than others.

In 1905 the difference in value of crop between the poorest yield and the best was $26.81 per acre, and in 1906 a difference of $19.25 existed, or more than the average total yield of an acre over the entire state, or over the entire cotton belt.

The better yields were made at exactly the same cost as the poorer save that of gathering and ginning the excess of production. In the crop of 1906, if the poorest crop had been made and marketed at a total cost of $30.00 there would have remained as profit $16.41. The cost of the better yield would have been $30.00 plus the cost of picking and ginning 325 pounds of cotton, or about $2.00, making the total cost of this crop $32.00 per acre, and leaving a profit of $33.66, or more than double the profit from the poorer variety.

It is not to advertise one or more varieties of cotton or to disparage another that this comparison is made, but to emphasize the fact that such differences do exist and that as one of the factors of better farming the subject should not be disregarded.

The following list gives the names and addresses of persons from whom our seed were obtained:

VARIETY.	NAME.	ADDRESS.
Russell Big Boll	J. L. Thornton	Alexander City, Ala.
Truitt	Alexander Seed Co.	Augusta, Ga.
Excelsior	Alexander Seed Co.	Augusta, Ga.
Tatum's Improved	R. D. Tatum,	Palmetto, Ga.
King No. 1	T. J. King Company	Richmond, Va.
Layton's Improved	R. D. Layton	St. Matthews, S. C.
Toole's Early	Alexander Seed Company	Augusta, Ga.
Toole's Early	W. W. Toole	Augusta, Ga.
Hawkin's Extra Prolific	B. W. Hawkins	Nona, Ga.
Edgeworth	J. C. Little	Louisville, Ga.
Lewis' Prize	W. B. F. Lewis	Lewiston, La.
Cook's Improved	J. R. Cook	Ellaville, Ga.
Moss' Improved	B. D. Moss	Norway, S. C.
Peterkin	J. A. Peterkin	Fort Mott, S. C.
Herlong	Edward Bancroft	Athens, Ga.
Southern Hope	Department of Agriculture	Washington, D. C.
Cook's Long Staple	Mrs. W. H. Cook	Utica, Miss.
Allen's Long Staple	J. B. Allen	Port Gibson, Miss.
Griffin's Long Staple	F. L. Hogan	Starkville, Miss.
Griffin's Long Staple	J. B. Griffin	Greenville, Miss.
Schley	J. C. Turnipseed	Griffin, Ga.
Cleveland Big Boll	J. R. Cleveland	Decatur, Miss.

Mississippi Agricultural Experiment Station.

BULLETIN No. 99.

FERTILIZERS.

By E. B. Ferris.

Figure 1.—Manure Spreader.

AGRICULTURAL COLLEGE, MISSISSIPPI.

January, 1907.

Tucker Printing House, Jackson, Miss

McNeill Experiment Station, February 1, 1907.

Sir:—

I submit herewith manuscript for bulletin on Fertilizers, being results obtained at the McNeill Experiment Station for a period of five years.

Respectfully

E. B. Ferris,
Assistant Director

W. L. Hutchinson, Director,

Mississippi Experiment Station.

FERTILIZERS

E. B. Ferris.

Introduction.—The consumption of commercial fertilizers in Mississippi has increased enormously in recent years, having grown from 17,000 tons in 1895 to 137,000 tons less than ten years later. The greater portion of these fertilizers are used in what is known as the "Pine Belt" of the state, and as this section is yet the most undeveloped portion of the state, from an agricultural standpoint, it is evident that the fertilizer industry in the state of Mississippi is yet in its infancy.

Do fertilizers pay.—In certain sections of Mississippi, notably in the two prairie belts, there are soils that do not respond to commercial fertilizers; in other sections the soils may respond to fertilizers, but the people are not accustomed to using them and are in a measure prejudiced against them, claiming that fertilizers injure the land. Frequently when small quantities of fertilizers are applied they stimulate a greater root development in the crop, which enables it not only to use the plant food in the fertilizer itself but to take more from the soil than it would otherwise have done had the fertilizer been left off. To this extent only do commercial fertilizers leave the soil poorer than they found it, and this is true only in the shiftless and thoughtless methods of farming, for by properly rotating the crops and giving the legumes a prominent place, the soils may be built up permanently with commercial fertilizers and at a profit, each year, of several hundred per cent. on the cost of the purchased plant food. At McNeill it takes only a glance at a fertilized and an unfertilized plot of land to tell that fertilizers do pay handsomely, a judicious investment of two dollars in a fertilizer frequently giving a twenty dollar increase in corn or cotton, while fruits and vegetables give a much higher percentage of increase.

In presenting this pamphlet on the use of fertilizers what is said is based on the results of five years experiments at McNeill where numbers of tests have been conducted to show the effects of fertilizers, manures, and restorative crops on fruits, vegetables, and the staple crops of the farm. The McNeill station is located in south-east Mississippi, the soils on the farm being sandy and sandy loams similar to those which occur throughout the long leaf pine belt, which occupies an area of some 15,000 square miles, or practically one third of the entire state.

Chemically these soils are especially lacking in nitrogen and phosphorus and before they can be made to grow crops profitably, at least these two elements of plant food must be supplied. A glance at the following analyses of soil and subsoil taken from the station's main experiment field will show plainly this deficiency:

Analyses of Soils taken From Station Field.

Character of Soil.	Chemical Analysis—Per cent.										Physical Analysis Per cent.			
	Sulphur Trioxide.	Moisture.	Volatile and Organic Matter.	Insoluble Matter.	Soluble Silica.	Iron and Aluminum Oxides.	Calcium Oxide (Lime).	Magnesium Oxide.	Phosphoric Acid.	Potash.	Sand.	Silt.	Fine Silt.	Clay.
Surface Soil	.055	4.450	4.50	85.28	.051	4.80	.220	.162	.023	.142	53.44	28.65	3.86	5.40
Subsoil	.055	.84	3.58	86.42	.066	7.83	.170	.140	.017	.210	48.78	28.37	3.45	14.92

Of the dozen or more chemical elements that enter into the composition of soils and plants, it is conceded that only four are ever lacking in soils for the best development of crops; these are calcium, phosphorus, nitrogen, and potassium. Calcium, supplied by lime, is so seldom lacking that it is practically never taken into consideration in this state, and, if used at all, is supplied for its indirect effect. The other three elements are contained in every complete commercial fertilizer sold in Mississippi, the state laws holding that a fertilizer is not complete unless all three of these elements are present. There is no single raw material that contains all of these elements in the proportion in which they appear in a complete commercial fertilizer, though cottonseed meal does contain the three elements in what might be called an unbalanced ration for crops. In order, therefore, to make a complete fertilizer we must take one ingredient containing nitrogen, another containing phosphorus, and a third containing potassium, and mix them together in the proportion best suited to the particular soil or crop. Nitrogen is supplied largely in the South by cottonseed meal, though to some extent by slaughter house products, nitrate of soda, and castor pomace; phosphorus is supplied also by slaughter house products, but largely by acid phosphate which is obtained by

treating the raw phosphate rock, finely ground, with sulphuric acid; potassium is imported to this country from Germany in several forms, of which kainit, murate of potash, and sulphate of potash are the most common. The average complete commercial fertilizer sold in Mississippi contains about 1.75% of nitrogen, 10% of phosphoric acid, and 2% of potash and roughly speaking would be made by mixing together 600 lbs. of cottonseed meal, 1200 lbs. of acid phosphate, and 200 lbs. of kainit, or other materials furnishing about the same quantities of nitrogen, potassium, and phosphorus.

The work at McNeill has been to find out first if all three of these elements are necessary in a fertilizer for these pine soils; second, to find in what proportions it is best to supply them for the several crops; and third, to determine the effects of animal manures and restorative crops on these lands both with and without the addition of commercial fertilizers. The station has almost an ideal field in which to conduct tests with fertilizers, the lands being practically level, and, so far as the eye can tell, almost completely uniform in physical composition. Then, too, having been so recently cleared from the original growth of timber, the discrepancies frequently due to previous cultivation and cropping do not necessarily interfere here with uniformity of results. The soils of this section are most susceptible to the use of fertilizers, in fact, it does not pay to cultivate them, even when freshly cleared, without the application of fertilizers.

The parked area.—Mention will frequently be made in this bulletin of the parked area and it will be well to explain that in the fall and winter of 1902-03, thirty head of steers were penned on five acres of land and fed for one hundred days on cottonseed meal and hulls. The troughs were moved at intervals so as to cause the cattle to distribute the manure as evenly as possible over the land, and several times during the feeding period, the land was plowed to prevent the washing of the manure over the surface. The land being comparatively level, very little of this manure was lost, and the soil, being of a sandy nature, was not injured by the tramping of the cattle even in the wettest weather. The effects of this manure on subsequent crops has been quite marked, being practically as great in 1906 as it was in 1903, the first year after the work was done. The effects of this parking will be discussed under several different headings to follow, but the following statement will serve to show its benefits: the average yield of cotton on the unfertilized soil here has been 405 lbs. per acre of seed cotton,

while three years results on this parked land show an average yield of 1253 lbs. per acre; the yield of cotton grown for four years continuously on the same land and fertilized with a mixture of two parts acid phosphate and one part cottonseed meal at the rate of three hundred pounds per acre has averaged 933.5 lbs. of seed cotton per acre, while the average of three results with the same fertilizer on the parked land has been 1840 lbs. per acre; the yield of corn for three years has averaged 21.4 bushels more per acre on the parked land than on similar soils unmanured.

Rotation plots.—Mention will also be made frequently of the station's rotation plots. Beginning in 1903, four plots of land of ½ acre each were selected on which to test the effects of rotating crops as compared to growing one crop continuously on the land. Three of these plots are made to grow alternately cotton, corn followed by cowpeas, and oats followed by cowpeas, making five crops in three years. A fourth plot grows cotton continuously. The original plan was to compare rotations with and without fertilizers with continuous one crop cultivation, so half of each plot was fertilized while the other half was left unfertilized. Two years results, however, showed that unless the peas in the rotation plots received some fertilizer they made practically nothing at all and consequently would have no effect towards improving the soil. For this reason, in 1905 we began fertilizing the peas following the oats, using acid phosphate alone under them at the rate of 200 lbs. per acre. In 1903 cotton made practically the same yields per acre on the fertilized portions of plots 3 and 4, giving 1120 lbs. per acre on the one and 1118 lbs. per acre on the other. Since that time plot 4 has grown cotton continuously, while plot 3 grew corn and cowpeas in 1904, and oats and cowpeas in 1905, coming to cotton again in 1906. In 1906 plot 4 made 936 lbs. of seed cotton per acre while plot 3 made 1312, showing that the one was decreasing while the other was increasing in productiveness, due alone to the rotation with cowpeas. Mention will be made later of other effects from this rotation.

Nitrogenous materials.—With the exception of leguminous crops which obtain their nitrogen from the atmosphere, every crop tested here on the natural soil has been materially benefitted by the application of nitrogenous fertilizers. Five years work with cotton has given an average increase of 30% in yield from nitrogen alone as furnished by nitrate of soda, or dried blood, and, 40% when furnished by cot-

tonseed meal. Nitrogen furnished by 224 lbs. cottonseed meal and 112 lbs. of nitrate of soda has increased the yield of beans from an average of 780 lbs. per acre to 1,740 lbs., or 123%. In fertilizer work done here the greater portion of nitrogen used has been supplied by cottonseed meal, this being the cheapest source and the one from which the greater part of that used in the state is obtained. For quick growing crops, such as certain vegetables, we have always furnished a part of the nitrogen by the use of dried blood or nitrate of soda, while for crops like strawberries or peaches, occupying the land several years in succession, the nitrogen in raw ground bone has proven very effective. As stated, the use of nitrogenous fertilizers has always been very effective here on the natural soil, still our results point conclusively to the fact that it is not best to purchase nitrogenous materials for application directly to the soil. In 1903, after the cattle had been fed on certain land the winter before, we conducted some tests with cotton and corn to see the benefit of the manure and also to find the best fertilizer with which to supplement the manure from the cattle. The best yield of corn was 54 bushels per acre and was obtained by the addition of phosphorus alone, this doing fully as well as when nitrogen and potassium were applied along with it. One of the best yields of cotton the same year was 1,970 lbs. per acre obtained also by the addition of phosphorus alone. For three years we have conducted tests under corn on the same soil and each year have had cowpeas follow this corn. This year ten combinations of plant food elements were used under corn on this land, doing everything in triplicate. The three plots having phosphorus alone averaged practically as much as any plots having a complete fertilizer. This goes to show the benefit of cowpeas, and to indicate that it is unwise to purchase nitrogen in combined forms for cotton and corn, or crops of their kind, when it is so much less expensive to get it as a by product from cattle, or directly from such crops as cowpeas, peanuts, etc. A most convincing illustration of this was had this year in our rotation plots, where cotton on the unfertilized half (following peas the year before fertilized with phosphorus alone) made 710 lbs. per acre as compared with 360 lbs. per acre on the blank plot beside it, and 936 lbs. per acre on the plot where cottonseed meal and acid phosphate had been applied to the unrotated land. Theoretically when an animal consumes a feed some 90% of the fertilizing elements contained therein are voided in the manure and if properly handled can be utilized for crops. The extent to which this may be done in practice, depends

largely on the character of the soil, first as to whether or not it stands greatly in need of plant food elements, and second as to whether all of this manure may be got on the soil cheaply and incorporated into it. Perhaps the cheapest and most effective way to get the full effect from the feeding of cattle is to have them drop the manure directly on the soil, for in this way the liquid as well as the solid excrement is saved, which cannot be done otherwise without considerable expense in handling. The soils of the pine belt are of such a nature that tramping does not hurt them even in wet weather, and standing as they do, greatly in need of chemical plant food, the maximum effect of these manures may undoubtedly be realized. For four years since feeding cattle on this land the effect of the manure is still almost as perceptible as at first.

Phosphorus.—Phosphorus is the crying need of the soils of this section and in every instance where it has been applied the increase of the crop has been most marked. An average of seven results obtained in five years shows that phosphorus alone has increased the yield of corn from 15.7 bushels per acre to 27.1 bushels, or 72%; with cotton an average of thirteen results with no fertilizer gave 405 lbs. of seed cotton per acre while an average of seven results where 100 lbs. of acid phosphate was applied gave 817 lbs. per acre, or an increase of 102%. Results so far show practically as great an increase from 100 lbs. of acid phosphate per acre on corn and cotton as from 200 lbs., or more. Its effects on fruits and vegetables have been as marked as under cotton and corn, an application of phosphate alone giving, with an average of three years results, an increase in yield with beans from 39.3 bushels per acre to 81.6 bushels per acre, or 107%. The addition of nitrogen to an application of phosphorus has been found much more necessary with fruits and vegetables than with such crops as cotton, corn, and sweet potatoes. We have been somewhat surprised to find that the insoluble phosphoric acid of bones and the reverted phosphoric acid of acid phosphate have apparently had as good effects in increasing the yield of cotton and corn as the water soluble, and other results with raw ground phosphate rock indicate that where there is much decaying organic matter in the soil, such as is the case when cowpea vines are turned under, that the cost of supplying phosphorus may be materially reduced by the use of the untreated rock. Untreated rock can be bought in this section for six or seven dollars a ton and it contains twice as much phosphorus as the acid phosphate. A great saving ought to be effected by using it in large quantities in

connection with cowpeas, the last furnishing nitrogen and at the same time making the phosphorus of the rock available during the process of their decay. Then, too, this untreated rock might be mixed to great advantage with the manure litter of the farm.

Potash.—The use of potash here has not on the whole proven helpful and the average of all results would likely show that when added to acid phosphate or cottonseed meal either alone or in combination it has not given an increase of crop. The average yield of cotton from unfertilized plots here has been 405 lbs. per acre and the average of six results obtained in four years where 100 lbs. of kainit was applied per acre has been 443 lbs., an increase of 9.1%. Corn has yielded an average of 16.8 bushels per acre when no fertilizer was applied and when 100 lbs. of kainit per acre was used, the average of six tests in five years has been 18.4 bushels per acre, an increase of 9.5%. An average of six results with corn obtained in four years shows that when 100 lbs. of acid phosphate and 100 lbs. of cottonseed meal is applied per acre the yield of corn was 28.3 bushels while the addition of 100 lbs. of kainit to this mixture gave in five tests, 29.6 bushels per acre. When fertilized with a mixture of acid phosphate and cottonseed meal, applied at the rate of about 125 lbs. of each per acre, the average of six results with cotton in four years has been 1,008 lbs. of seed cotton per acre, while the addition of about 100 lbs. of kainit per acre to such a mixture has averaged 878 lbs. on five results obtained in three years. Three results obtained in 1903-04-05 show that 100 lbs. of cottonseed meal gave an average yield of 580 lbs. of seed cotton per acre, while the same number of results obtained the same years show an average of 583 lbs. of cotton from an application of 135 lbs. of cottonseed meal and 50 lbs. of kainit. In 1904, 100 lbs. of acid phosphate gave a yield of 29.1 bushels of corn from an acre while the same year 148 lbs. of acid phosphate and 70 lbs. of kainit gave 31.1 bushels.

The best work done here with fertilizers under vegetables has been done with beans. The average of three tests show that the unfertilized soil made 39.3 bushels of beans per acre and the addition of 234 lbs. of kainit increased this yield in two years' test to an average of 45 bushels per acre. When fertilized with a mixture of cottonseed meal, dried blood, and acid phosphate the average of five results obtained in five years has been 111.3 bushels of beans per acre, and the addition of kainit to the above mixture has given an average of

97.1 bushels of beans per acre in the same number of results obtained during the same number of years. In 1905 a mixture of 506 lbs. acid phosphate and 234 lbs. of kainit gave a yield of 1,380 lbs. of beans per acre while the same quantity of acid phosphate alone gave 1600 lbs.; again in 1906 the same mixture of acid phosphate and kainit gave a yield of 1904 lbs. of beans per acre while the acid phosphate alone gave a yield of 2608 lbs. The average of all results obtained here with beans during the past five years would show a slight decrease of yield in the crop due to the addition of kainit to any other ingredient of a fertilizer.

In work with fertilizers under cabbage, the addition of kainit to a mixture of acid phosphate, cottonseed meal, and nitrate of soda has not shown a uniform increase in yields. In fact, out of three separate results one shows an increase due to kainit and the other two show a decrease. By far the best yields of cabbage, Irish potatoes, and onions ever made here have been on land improved by animal manures and this supplemented by cottonseed meal, nitrate of soda, and acid phosphate, and on which no potash salt, as such, has ever been applied. The addition of potash salt to fertilizers for strawberries, asparagus, and Irish potatoes has shown slight increases in the yields of these crops, but hardly enough to pay the cost of the potash salts, or even to justify us in concluding that it was not within the limit due to unavoidable error in conducting the tests. On the whole our results would show that potash is hardly deficient in the soils at this time, and if at all so slightly that the small percentage contained in cottonseed meal meets all the wants of the average crop. For the past three years this station's bill for fertilizers has amounted to more than $500 a year, yet the cost of the potash used has been below $15 a year, and this year, out of $533 spent, only $3.75 was spent to purchase potash salts, this to be used on test plots.

FERTILIZERS FOR SPECIAL CROPS.

Cotton.—Results here have shown that from 200 lbs. to 300 lbs. of fertilizer per acre is all that can be profitably applied to cotton or corn without first building up the soils to where they are in better mechanical condition and can furnish a better supply of water. Undoubtedly we should work them up to the point of using several times this amount of fertilizer, but this can only be done gradually by the incorporation into the soil of more organic matter or humus, either

by growing and plowing under leguminous crops, or by the use of animal manures in considerable quantities. On the average soils of this section, perhaps the most economical results will be obtained from a mixture of three parts acid phosphate and one part of cottonseed meal, but by growing cowpeas frequently on the land, or by the use of animal manures, we ought in a short time to make phosphorus alone supply all the deficiencies of the soil. Some of the best yields of cotton that have been obtained here were on plots fertilized with raw ground bone at the rate of 165 lbs. per acre.

Corn.—The same remarks will apply to fertilizers for corn, except perhaps the proportion of cottonseed meal to acid phosphate should be more nearly equal. Results here point conclusively to the fact that cowpeas may be made to take the place of cottonseed meal in a fertilizer for corn and there has been very little difference in the yields of corn receiving an application of nitrogen and phosphorus, whether these two elements were supplied by cowpeas and acid phosphate, animal manures and acid phosphate, cottonseed meal and acid phosphate, or raw ground bone furnishing the same quantities of the two elements. An application of 165 lbs. of ground bone per acre has slightly led all other combinations of fertilizers under corn, except on the parked area where acid phosphate alone has done as well as any other fertilizer

Winter grains.—Crops like oats, wheat, and rye, growing in winter and early spring, require relatively more nitrogen than phosphorus since nitrification in the soil is not taking place actively at these seasons. It is always best to plant such crops here in the fall, since there is practically no danger of witner killing and the crops mature in the early spring before serious droughts come on, and at a time when the hay from them may usually be cured in clear weather. A mixture of 150 lbs. each of acid phosphate and cottonseed meal applied before planting in the fall and followed early in March by a top dressing of from 50 to 100 lbs. of nitrate of soda has given excellent results here, however, when such crops follow cowpeas or other legumes the cottonseed meal may be left off. The nitrate of soda in the spring has helped wonderfully here and in applying it we usually run a smoothing harrow over the oats to work it into the soil. This can be done without serious injury to the stand of oats, while the cultivation itself is of material benefit to them.

Sweet potatoes.—Tests with fertilizers under sweet potatoes have been conducted here since the station started, but it is an unsatisfactory crop for such work when small plots are used and no very conclusive results have been obtained. In 1906 ten tests were conducted in duplicate with this crop and the average of these showed that 200 lbs. per acre of acid phosphate slightly led all other fertilizers, giving a calculated yield of 291 bushels per acre. This was on land where cowpeas had grown the year before. Under average conditions existing in this section we would recommend for this crop a mixture of three parts acid phosphate and one part of cottonseed meal applied at the rate of from 200 to 300 lbs. per acre.

Sugar cane.—Numerous tests have been conducted here with fertilizers under sugar cane and the majority of results have shown no increase in yields due to the addition of kainit to a mixture of acid phosphate and cottonseed meal. The most economical results have been obtained from a mixture of equal parts acid phosphate and cottonseed meal applied at the rate of 500 lbs. per acre. Several tests have shown that it is better to apply all of this fertilizer early in the spring, rather than use a part of it then and the balance later in the growing season.

Cowpeas and peanuts.—Both of these crops do well in this section and the station has succeeded in growing them to perfection. Numbers of test have been conducted with fertilizers under the two crops and acid phosphate alone seems to be the only ingredient of a fertilizer required. This station uses acid phosphate at the rate of 200 lbs. per acre under all cowpeas and peanuts and prefers to plant the two crops during the latter part of June rather than earlier in the season, for this reason, that they mature when the seasons are more favorable for curing the hay, and less favorable to the sprouting of the peanuts in the ground.

Vegetables.—While cottonseed meal is an ideal source of nitrogen for such crops as cotton, corn, etc., it becomes available to plants only after going through a process of decay, and, quick growing vegetables might suffer in waiting for this to occur. Therefore, for nearly all vegetables we would recommend a mixture in which one-half the nitrogen is supplied by cottonseed meal and the other half by nitrate of soda or dried blood, preferably nitrate of soda. A convenient mixture here for nearly all vegetables is made in this proportion: 250 lbs.

of cottonseed meal, 125 lbs. nitrate of soda, and 500 lbs of acid phosphate. This mixture is used under all vegetables, the amount being varied with the crop. Under the present condition of our soils we have found that 250 lbs. per acre of such a mixture gives the most economical results with beans; 500 lbs. per acre, with Irish potatoes and tomatoes; and 1000 lbs. per acre, with cabbage, onions, and asparagus. As the soils are built up mechanically the quantity of fertilizer used may be increased in the same proportion. Crops like asparagus, occupying the land continuously for years, do not necessarily require the nitrate of soda and the entire quantity of nitrogen may be furnished by the cottonseed meal or the raw seed themselves. Indeed, raw ground bone might be made to take the place of both cottonseed meal and acid phosphate with no detriment to the yield of asparagus. In applying such a mixture for vegetables as above mentioned, we find it well to put the meal and acid phosphate on the land before planting the crops and to apply the nitrate of soda later when the crops have begun to grow. This lessens the liability of having the soluble nitrate wasted by leaching before the crop is ready for it. It is advisable that truck growers should have a supply of nitrate of soda on hand to be used as a top dressing for vegetables that they wish to hasten to their earliest maturity.

FIG. 2.

Fruits.—Strawberries and peaches have been the only fruits with which the station has conducted tests with fertilizers and no positive conclusions have as yet been drawn from the work with peaches. These tests with fertilizers under strawberries have been in progress for four years on the same plots of ground. The first year no records were kept because the yields amounted to practically nothing. A mixture of 200 lbs. cotton seed meal, 200 lbs. of acid phos phate, and 100 lbs. of kainit has been used as a unit application from the start. This mixture gave a calculated yield per acre of 3,979 quarts in 1904, 2,620 quarts in 1905, and 2,440 quarts in 1906; the same mixture with the

kainit left off gave 3,912 quarts in 1904, 2,240 quarts in 1905, and 2,520 quarts in 1906; doubling the amount of acid phosphate and leaving the cottonseed meal and kainit normal gave yields as follows: 4,598 quarts in 1904, 2,990 quarts in 1905, and 2,250 quarts in 1906. Minor changes in the proportion of these ingredients did not show material differences in the yields of the berries. Beside these fertilizer test plots, other berries have been grown and were fertilized with raw ground bone, and, while the actual yields were not determined, there was no apparent difference in the quality or quantity of the fruit. The station would recommend for strawberries a mixture of two parts acid phosphate and one part cottonseed meal, at the rate of 600 lbs. per acre, one half to be applied in the fall, and the other half after the picking season is over in the spring. The same quantity of fine ground bone, applied in the same way, would likely be as efficient and is a very satisfactory fertilizer to use for both strawberries and peaches. We have not been able to detect that the presence or absence of potash salts in a fertilizer has had any bearing in the color of the fruit.

Methods of application.—There are two general methods of applying fertilizers and manures, broadcast and in the drill. It is thought best to make very large applications broadcast, but the greater part of the fertilizers used in this state are applied in the drill. Roughly speaking we would say that any application of commercial fertilizers heavier than 1,000 lbs. per acre would best be applied broadcast, and any smaller amount in the drill. A manure spreader is the best and cheapest means of handling barnyard manure, provided, of course, there is enough of this manure on the farm to justify one in investing about $100.00 in such a machine. These manure spreaders can be regulated to distribute uniformly almost any quantity of manure per acre and will apply it either broadcast or in the drill. They can also be used for making heavy applications of commercial fertilizers.

FIG. 3.

The best and most economical way of applying commercial fertilizers in the drill is by means of a fertilizer distributer. The station has used a Gantt distributer during the past year and has found it

very satisfactory. These machines look very much like an ordinary cotton planter and will apply practically any quantity of fertilizer per acre from 100 to 600 lbs. They cost between four and five dollars.

A good proportion of the fertilizers used are applied by hand which is a very satisfactory way except when the wind interferes, which is nearly always the case. A cheap tin fertilizer horn about four feet long and costing twenty or twenty-five cents enables one to do this work much better and with a great deal less stooping. Figs. 2 & 3.

Time of application.—On soils having considerable clay in the sub-soil, there are practically no mineral constituents of a fertilizer lost by leaching, as these, though soluble in the fertilizer itself, quickly become insoluble when they come in contact with other minerals in the soils; so, if the land is protected against surface washing, it is best to apply all the mineral elements in advance of planting the crop, partly because they are sure to be there ready for the needs of the crop, but also because it is more economical to make one than two or more applications. Even though nitrogen is leached from the soil and also lost by evaporation at the surface, it is doubtful if it pays to make more than one application of cottonseed meal, or of a mixed fertilizer containing it. Three results here obtained with sugar cane have shown that it pays better to apply 1,000 lbs. of fertilizer before planting the cane than it does to apply 500 lbs. of the same fertilizer before planting and 500 lbs. again about the middle of the growing period, the average of the three results of this experiment being 54,-832 lbs. as compared to 51,261 lbs. of cane per acre in favor of the single application. This would not likely be the case with such an immediately available nitrogen compound as nitrate of soda, and the McNeill station prefers to use nitrate of soda as a top dressing to the growing crop, working it into the soil with hoes or cultivators

Depth of application.—In 1904 this station grew eleven varieties of cotton in plots of four rows each. Two rows of each plot were first two-furrowed and fertilized at the rate of 300 lbs. per acre was applied on top of the list, harrowed in, and the bed completed. The same quantity of fertilizer on the other two rows of each plot was applied in the drill about three inches deep, mixed by running a scooter plow through it, and then bedded upon. The deep application gave uniformly more cotton at each picking than the shallow application. The average of the eleven plots receiving the fertilizer near the surface

was 834 lbs. of seed cotton per acre, while the average of the plots receiving the fertilizer about three inches beneath the surface was 1,000 lbs. of seed cotton per acre. Three inches is the depth most often recommended for applying fertilizers, though for such crops as cabbage, onions, radishes, strawberries, etc., having roots near the surface, a shallow application is likely better, and the station has adopted a plan practiced in the trucking sections of the state, of applying the fertilizer for shallow rooted fruits and vegetables on top of a list, harrowing this down and mixing the fertilizer with the soil at the same time, and afterwards completing the beds on which the seeds or plants are to grow.

Conclusion.—It is estimated that the farmers of the fertilizer belt of Mississippi are spending $100,000 annually for the purchase of potash in their fertilizers. So far as results at McNeill go to show, this money is practically wasted, and we would urgently insist that the thinking men of the state, merchants, farmers or manufacturers, who can control the composition of fertilizers, either discontinue the use of potash or convince themselves that it is necessary under their own conditions. The McNeill station would also insist on the use of less cottonseed meal applied directly to crops, provided, of course, the farmers themselves would get the nitrogen that the soils need from other sources. Cowpeas will supply this nitrogen and they can be grown every year after corn, oats, and practically all vegetables. By rotating the crops cowpeas may also be made to furnish a large part of the nitrogen to such crops as cotton, strawberries, and sugar cane, occupying the land one year or longer. Spanish peanuts will add much nitrogen to soils, especially if hogs are allowed to graze them off, and there is certainly no surer money-maker on the farm than pork grown and fattened on such crops. The growing and feeding of cattle in our state, except for dairy purposes, has not on the whole been profitable, yet we are convinced by work done here, that by buying and selling judiciously, we may, under average conditions, feed cottonseed products to cattle and get the manure on the land as a profit. To show what this manure is worth, we refer to a statement under the heading of "parked area" where since 1903 the average yearly increase in yield of corn and cotton, due alone to the manure from cattle, has been 848 lbs. of seed cotton per acre and 21.4 bushels of corn per acre.

Mississippi Agricultural Experiment Station.

BULLETIN NO. 100

FARMER'S INSTITUTE BULLETIN, 1906

E. R. Lloyd.

FIGURE 1.—ALFALFA IN MISSISSIPPI.

AGRICULTURAL COLLEGE, MISS.,

December, 1906.

Institute Workers.

J. C. HARDY.....President A. & M. College

E. R. LLOYD.....Conductor

W. L. HUTCHINSON.....Director Experiment Station

A. B. McKAY.....Professor of Horticulture

J. C. ROBERT.....Professor of Veterinary Science

G. W. HERRICK.....Professor of Biology

J. W. FOX.....In Charge of Delta Sub-Station

J. S. MOORE.....Professor of Dairy Husbandry

W. R. PERKINS.....Professor of Agronomy

C. T. AMES.....In Charge of Holly Springs Sub-Station

A. SMITH.....Professor of Animal Husbandry

E. B. FERRIS.....In Charge of McNeill Sub-Station

G. L. CLOTHIER.....Forester

D. C. MOORING.....Assistant Horticulturist.

INTRODUCTION.

The bulk of the institute work in this State is done during the months of July, August, and September, because at this season most of the farmers have "laid by" their crop and have more time in which to attend the meetings; and again, this is the vacation period for the College, and the Professors do about seventy-five per cent. of the institute work.

During the year 1906, there were one hundred forty-two institutes held with a total attendance of 17,645. Besides the regular institutes held this year, an institute train, known as "The Diversified Farming Special" was run over the lines of the Illinois Central and Yazoo & Mississippi Valley roads from October 2nd to 12th. This train was furnished to us free by the Illinois Central management. During the progress of this train seventy-five stops were made in Mississippi and we spoke to 9,127 people. The annual roundup institute was held at the Agricultural College September 5, 6, and 7th, and, while the attendance was not as large as we had hoped for, the interest was all that could be wished.

We feel gratified with the results of this year's work and hope that an increased appropriation may be had to enable us to extend the work and broaden its field of usefulness to the farmers of the State.

ALFALFA IN MISSISSIPPI.

B. H. Strong.

All Agrostologists agree that Alfalfa is the most valuable forage plant the world has ever known on account of its high percentage in protein, its prolific production, its longevity of life and its ability to fertilize the soil, through its root nodules with a nitrogenous fertilizing element of the atmosphere.

All professors of Agronomy agree that soil which will grow alfalfa successfully is the most valuable land known to their profession, because on land where alfalfa grows all other plants known to the agricultural world will do best.

The history of this wonderful plant is somewhat shrouded in mystery but we are told by historians that it was brought from Media, Asia, into Greece about five hundred years before Christ, from Greece it found its way into Italy, from there into France and about two hundred years ago, we find it growing in Old Mexico, brought there by the Spaniards. From Old Mexico it found its way into the Pacific Coast country where it is grown best by the use of irrigation, and now we find it growing in its grandest perfection on the black prairie lands of East Mississippi without irrigation, without fertilization and without inoculation. My attention was first called to this wonderful plant by Dr. Cyril G. Hopkins, Chief of Agronomy and Chemistry in the University of Illinois, who is known as the famous soil expert. I found in travelling through the State of Illinois and in talking with Illinois farmers that Professor Hopkins' advice in all matters pertaining to the farm was treated with the greatest consideration. I heard so much about what Dr. Hopkins was doing and what Dr. Hopkins could do that I went to see him. He was kind enough to show me through his experimental fields, the improvement in the production of the soil and the improvement in the quality of corn, oats and wheat caused by his experiments and wise supervision was simply wonderful, and when we came to his experimental alfalfa field, he with pride pointed out to me a plot growing in perfection. The lands of Illinois are not naturally adapted to the growth of alfalfa, as they are low in lime and phosphate and by the proper application of lime and phosphate he had caused this plot to grow as it was. While standing there we could

see for miles over the black prairies of Illinois, covered with handsome homes, corn, wheat and oat fields, timothy and red clover meadows, blue grass pastures filled with fine cattle, horses, mules and hogs, I could not but compare the lands and conditions with the prairies of East Mississippi. Dr. Hopkins said to me, "The lands you now see are valued from $125.00 to $200.00 per acre, you can borrow on them almost their market value in money at four and four and a half per, cent. but if alfalfa would grow on the natural soil as you see it here three hundred dollars would be its value." Right then and there I decided that if alfalfa would grow on Mississippi soil, I would plant my land in it.

Now, ladies and gentlemen, this is my experience in alfalfa in Mississippi, and should it sound to you like the tales of "The Arabian Nights" and a little fishy, I invite you, the skeptic, to come to West Point. I will be glad to drive with you out to see my field in any kind of weather, winter or summer, and I promise to show you a sight that will make your

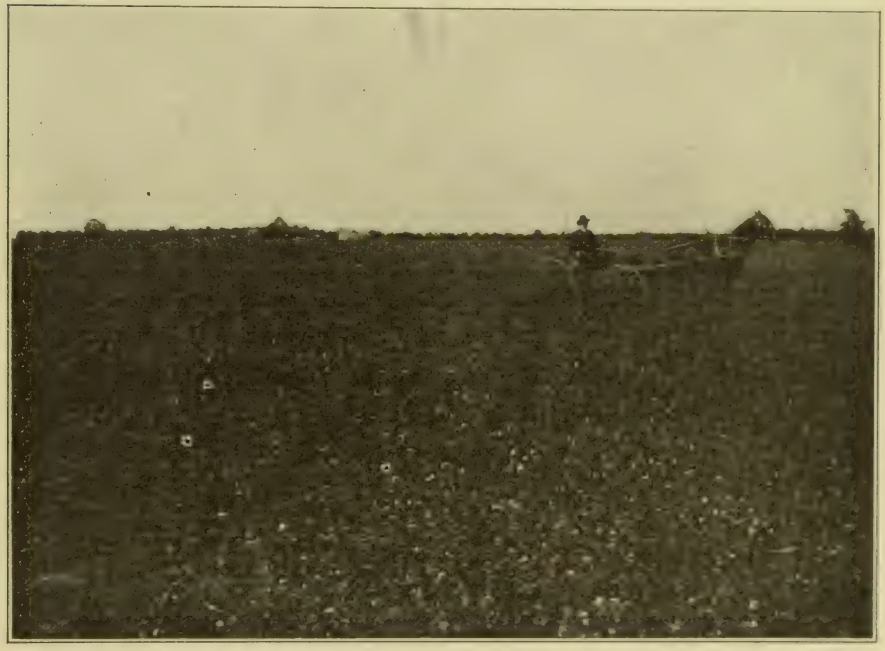

FIG. 2.—FIELD OF ALFALFA IN MISSISSIPPI.

hearts glad and send you home with the determination to grow alfalfa in preference to any other crop provided your land is adapted to its

growth, for as Dr. Hopkins said, in quoting Davenport, "They not only work for nothing but board themselves and pay for the privilege," and that is exactly what alfalfa will do for you.

In March 1903, I planted one half acre in alfalfa, I got one hundred pounds of inoculated soil from the alfalfa fields at the University of Illinois. I put this soil on the lower slope of my plot, which would enable me to test the soil for bacteria. After the plants were growing, I examined the roots on the upper and lower edge of the slope and found that it was all covered with bacteria, showing the land to be naturally inoculated or had become so from melilotus growing in the vicinity. The half-acre was ready to cut for hay by the first of July, four months from seeding, and cut 1000 pounds of hay. It was cut again the 15th of August and the middle of October just before frost. The three cuttings the first year made two and one half tons of hay per acre. In March, 1904, I planted 130 acres, ten acres of this field I put in hog pasture, which proved very profitable. After paying all expenses, for plowing, seeding the land and saving the hay, the 120 acre meadow netted me $1075.00. The hay from this field cut on July 15th was rewarded the gold medal at the St. Louis Exposition. I cut hay from this field in 1905, five times, which cut over five tons to the acre. As you all know, it rained nearly all summer of last year, which caused me to lose a great deal of hay, but I managed to save and sell enough to net me over $2500.00. I leased the 130 acres to Mr. McAdams for this year, for the sum of $1250.00, $500.00 to be paid July 15th, which has been paid, $750.00 due November 1st, which is ready and waiting in the bank for me. Mr. McAdams cut and saved up to September 1st, three tons per acre. It was cut four times. The two first cuttings made a ton each per acre, the two last cuttings one half ton each. With good seasons by November 1st, he will get one ton per acre more, which will make four tons for this year. The three tons per acre have practically been sold at $15.00 per ton, f. o. b. West Point, and with the ton per acre he will get before frost will make for this year $60.00 per acre, gross. The cost of cutting, ricking, baling and hauling to market is about $3.00 per ton, giving a net profit of $48.00 per acre. Gentlemen and ladies, that is ten per cent. on $480.00 per acre or on land that has been in a constant state of cultivation for seventy years, planted in cotton and corn and on which there has never been put one pound of fertilizer of any kind. If this statement fails to interest you, all I have to say is, you don't love the dollar. I have had the soil, subsoil, and lime rock, the foundation of the black prairie land of East

Mississippi, analyzed; I find from the analysis and the geological formation that it is the same class of land as the chalk lands of England and France which are said to be the best alfalfa lands known to the agricultural world.

Stock men in Illinois tell me that one ton of alfalfa is worth for feeding value, two tons of timothy, two tons of alfalfa is worth three tons of clover, and we can grow on our prairie lands in East Mississippi, which are now selling for $20.00 to $35.00 per acre from five to six tons of alfalfa. We grow on one acre of our land as much feed for horses, cattle, mules and hogs in one season as the man in Illinois will grow on one acre of land in eight to twelve seasons, and their land sells as high as $200.00 an acre. Ask Professor Hutchinson, Professor Fox and Professor Perkins of the College if the feeding value of this plant as I have shown it is correct, and then write to Illinois, and find out how much timothy and red clover they grow per acre and you will find my statement is not exaggerated.

Alfalfa as a fertilizer is wonderful. I have a two and a half acre block of land adjoining my meadow that was covered with an elm and mulberry thicket, I had it cleared all but the stumps and sowed in it alfalfa two years ago, on account of the stumps it was impossible to run the hay machinery over this field. This year I gave Mr. McAdams permission to plow it up and plant it in corn. It is said by our best farmers that this plot of ground will produce from 80 to 90 bushels of corn per acre. While this land is low and rich, I don't believe it would have produced without aid of the three years in alfalfa, over forty bushels. In Colorado it was not known that they could produce Irish potatoes successfully until after they had plowed up their alfalfa fields, and planted them in Irish potatoes, and now the Colorado potato is known all over this county as the best and most of them are exported and shipped to fancy markets of the East. They tell us in the West that the most successful way to produce an orchard is to first plant the soil in alfalfa, let it grow for a year or two, then plow it so it will die, plant your trees; if the trees are planted while the alfalfa is alive and growing, it will kill them. I believe my land now will produce one bale of cotton to the acre while it only produced one-half bale before the alfalfa was planted.

As to the care you should give your meadows, I would advise the use of the disc harrow, the second year after seeding, the two years' growth will give it a long tough root which will stand the hackling

of the disc and seems to improve and thicken the stand. Set the disc almost straight, weight it down so it will cut from two to three inches deep, disc both ways across the fields, then run over it with an iron tooth harrow, setting the teeth almost straight. This will tear out all weeds and grasses that may be in it and cultivate the ground, which will give great results in the increase of yield in hay. This method is practiced in the West.

In sowing alfalfa in Johnson grass sod, I would advise plowing the land, thoroughly, in the fall, break it as many times as possible, try to kill the Johnson grass, sow the following March, thirty pounds of seed to the acre, and you will not be bothered very much with this grass. I believe the alfalfa will kill it in a few years. I prefer to sow alfalfa on land that has been in cotton because the cultivation of it leaves the land in fine condition, clear of weeds and grass, that might prove a detriment to the young plants. I prefer sowing any kind of land in the spring because you are sure to get a stand. The objection to fall seeding is we seldom get seasons that will bring up all the seeds, and should it be sowed later than the first of September, a hard winter will freeze it out. The seed are expensive, costing from four to five dollars per acre and a poor stand is worse than no stand at all, because it is almost impossible to re-seed and thicken the stand, after it is growing. The old plants will exhaust the young ones, having the same effect that the oak tree has on the sprouting acorn, making it necessary to plow and sow the land over to secure a perfect stand. In all cases use as much as 30 pounds of seed to the acre; parties here who have used less than this amount are not pleased with results.

In saving the hay, we have had best results by letting it cure in the windrow and should you get a rain on it while in this state, go over it as soon as the sun shines with a tedder, which will scatter it so it will dry in a short time. Then take it to the rick with a push rake. I find those made by Dain to be good and durable. I use the Dain alfalfa ricker to put the hay in ricks, which I prefer to any other method now in use. With two push rakes, one ricker, six good horses or mules, five men, I can save from 25 to 30 tons of hay from the windrow in ten hours. I believe the hay will cure in the rick, as well as it will in a large cock. In cocking the hay you will find it much more expensive and should it remain on the ground for several days it will almost smother and kill the alfalfa roots under it, while the grass around the cock will be several inches high, and will be knocked about and mashed down by horses and machinery. Get the hay off the

ground as soon as the leaves will rattle, and begin to shatter. As soon as the hay begins to heat in the rick, bale it. Use a hay knife, cut the rick through about every four feet, throw it off and allow it to cool before you bale it and it will keep without moulding. In this way you will preserve its green color which is very important when you sell it, as you will find that your customers want bright hay. Good sheds are very important, build a shed with posts twenty feet high, thirty feet long and twenty feet wide, cover with shingles; build it in the center of a twenty-five or thirty acre field. This shed will hold thirty tons of loose hay, and, by having the posts twenty feet high you can dump the hay in it with a ricker. A few tons of well cured hay will pay for the shed. If you simply rick it in the field, without the shed over the rick, cover the rick with green hay about two feet deep, this will settle and make it almost water proof.

As to the markets we have for this product, I am told by Mr. A. Gee, of Birmingham, Ala., who is one of the most reliable and responsible hay dealers in that state that the markets of Birmingham alone consume 14,000 cars of hay annually. Atlanta consumes fully as much; Savannah, Ga., is a great hay market. The Carolinas get all of their hay from the West. New Orleans and Mobile are great cities and right at our door, and the markets we have to compete with are hundreds of miles away. If all the lands in the prairie belt between West Point and Okolona, or between West Point and Macon that are naturally adapted to alfalfa were planted they would not supply the demands of Birmingham alone. I want to make this prediction for the black lands of Mississippi. I believe at the expiration of the next ten years East Mississippi will ship more mules, cattle and hogs, and for better profit than any section of country of its size in the United States. Then we will see handsome country homes, good macadamized roads, fine orchards and altogether the most prosperous country of the South. Our lands have made men rich and with proper management they will do so again.

With your permission, Mr. Chairman, I beg to mention another subject to the farmers of Mississippi, which I know is important to their welfare, the prosperity and the development of the state. For the last twelve years I have been thrown with northern and western farmers. I have been with them in their homes, and have had the chance to study their conditions. I find in every state that has the interest law of Tennessee, which is six per cent. legal and contract, the place where you will find most prosperity. For an illustration, we will take Ten-

nessee, only 125 miles north of us where they raise cotton, corn, cattle, horses and mules, the same products we produce. You will find lands that sell with us from $15.00 to $30.00 sell in Tennessee from $40.00 to $100.00 per acre. You will find the white man loves to live on his farm, you will find his home a thing of comfort and pleasure, you will also find that he values his land and gives it more attention than he does his bank stock, you will find that when a young man starts out on the farm with limited means, as they generally do, and has to go to the bank, that he gets all the money his chattle security will stand at 6 per cent. per annum and with this he buys the necessities of life on the cheap cash market of his town or city. I would like to see you shove a ten per cent. contract interest law down a white Tennessee farmer. Then you will please go with me to Mississippi or Arkansas where you find the ten per cent. contract interest law. We will start a young white Mississippian on the farm, he may be a graduate of this institution with scientific knowledge instilled into him by these learned professors, he knows how to till the soil intelligently. We give him a team of horses, wagon and all improved agricultural implements he may need. This is all he has, he goes to the bank, asks for enough money to supply the wants for a farmer of his calibre for one year. It may be here in Starkville, Columbus, West Point, or Greenville. The banker nine times out of ten will tell him they have no funds on hand but will advise him to go to a certain merchant, who is a customer of his. The young man goes as directed, tells the merchant that a certain banker has advised him to come to him. The merchant will first take an inventory of what he has, will then ask him how much it will take to run him through the year. He is only willing to let him have about two-thirds the amount asked for. He will then take a deed of trust on the young farmer's possessions. Makes a note for the full amount, charges him 20 per cent. straight, adds it to the principle. The note is due October 1st, and, if it is not paid at its maturity, the interest is compounded at ten per cent. until paid. This farmer will buy as much the last day of maturity as he did the day the note was made, which is generally March 1st, and pays 20 per cent. for the privilege. What are the results? It takes a cotton crop of 1905 to pay this debt, which only comes about once in a life time, and the chances are his stock is sold for half price to satisfy this unreasonable extortion, and we all wonder why this young man left the farm after graduating at this institution. Can any country trive and prosper under this condition? I will tell you it is impossible, and until you help this class of young Mississippi farmers, by giving them the privilege of cheap money, your

state will never prosper. Mississippi is known as an agricultural state, but that is wrong, Mississippi is a banking state, bank stock is the only thing that we have that sells for par and above par, and you know our bankers generally are strictly bankers, very few of them want any real estate at all. Ten years ago in Clay county the rich black lands were on the market for $10.00 and $12.00 per acre, they rented for $3.00 and the only people who were able to buy were bankers. And when you would approach them with a proposition of this kind, they simply laughed at the idea. Cotton buyers and merchants and all classes of business men in North Carolina get all the money they want to do business with for six per cent. interest. There you will find the red and rocky fields of Carolina in fine state of cultivation and everybody prosperous.

Ladies and gentlemen, six per cent. interest will bring foreign money into our state and I can prove it. Bankers and money loaners will tell you that it runs capital away from home. Please tell me where it will go. They said Mr. Wirt Adams, our Revenue Agent, would ruin the country when he made them pay taxes on loan money, they were all going to leave—where did they go? Six per cent. money will clear and drain your swamp land, it will make these old red hills produce as they never produced before, six per cent. money will build factories, will build cities. Give it to us, farmers of Mississippi, it is in your power to do so. How can it be done? Vote for the candidate for governor whose platform is 6 per cent. contract interest and who is willing to make it a criminal offense for man to charge more for his money. There is not a candidate in the field now for governor who advocates the change in this law, why? Is it because he is afraid or is it because he thinks the white farmer should pay more for the money he borrows than his nieghbor in Tennessee. If he thinks that, the farmer of Mississippi is doing himself a great injustice to vote for him. If he is afraid that he will incur the displeasure of the moneyed men, and lose his influence in the coming election, we don't want him, for a coward is not the man to select as Governor of Mississippi.

Gentlemen, when you send your next representatives to Jackson, let them know that you send them there to give you 6 per cent. money, and when it is done, old Mississippi will be herself again and times will be as good as they were before the war. I am right, and I know I am right, and if any fair, unselfish man will stop and think for a short time on this subject, he will agree with me. Alfalfa and cotton raised with six per cent. money will make Mississippi the most prosperous State of the South.

ALFALFA.

R. E. Smith.

After a forcible discussion of Alfalfa as a soil improver, a forage plant, and hay crop, the speaker said:

"The best time to sow alfalfa is when you have the ground prepared, and the best time to prepare the land is from the 20th of June to the 20th of July or 1st of August. You should do it just like you do your turnip patch; not wait as is frequently the case, with the turnip patch, until your wife asks, 'When are you going to plant turnips?' and you say right now and off you go to plant them.

"If you haven't your land prepared you have no business saying 'right now'. You should have your land prepared for at least two months; but if you will sow it now, plow your land very shallow, get a nice loose mulch on top before planting. Keep ever in view the fact that it is among the tenderest of plants when young and can be killed by the least unfavorable circumstances, so give it good treatment when young. If the land is poor fertilize it, and give the young plants plenty of food to enable them to start and get their tap root deep into the soil when they will be able to take care of themselves.

"I have found that a rich sandy loam is the best for alfalfa.

"When you have alfalfa with you it is there for a life time, so do you not think you could prepare the soil well once and give this plant a start? When once established your alfalfa will bring you from $30.00 to $50.00 per acre per annum.

"If you sow in the spring the crab grass and the weeds are sure to take it.

"Plant it in the fall before frost. It will stop growing only occasionally when you have your hardest freezes; but if you plant in the spring you will have lost that entire year.

"I would recommend to begin preparing your soil in June or July, by plowing and subsoiling about 18 inches deep. Then disc and drag until it is finely pulverized, repeating the surface work as often as grass or weeds make it necessary. The tramping of the teams and

the weight of the implements will have the effect of thoroughly compacting the under soil, which is very essential. Whenever you have a good season, between the 20th of August and the 1st of October, plant, using 20 to 25 pounds of the best seed per acre, harrow or plank the ground after seeding. If your purse is a little long, I would put on 25 pounds or more per acre. If you get too thick a stand, it will naturally die down to a proper stand, but if you haven't sufficient plants on the land there is nothing you can do except to plow it up and plant again the following fall.

"Alfalfa is quite chummy with Johnson grass and the latter does not hurt it like crab grass. Crab grass will wind around the roots of alfalfa and soon choke it to death. When crab grass once gets a start in alfalfa the only remedy is to plow it up and start over.

"The best time to cut alfalfa for hay is when it first begins to bloom, and, if you have a considerable area, you will find that by the time you get over, the first cut will be ready for the mower again."

The speaker said that while he had found the crop a very profitable one, he would advise every one to proceed cautiously in going into the growing of it. Plant one acre first and if successful with that, then plant ten acres, and later more if you have the room. The crop would be found to be one of the best that could be grown and the growing of it offered an excellent opportunity for diversification in our farming—a condition very much to be desired in the cotton belt.

HAIRY VETCH.

(*Vicia Villosa*)

E. R. Lloyd.

This annual leguminous plant is variously known as, Hairy vetch, Sand vetch, Russian vetch and Winter vetch. It is a native of Western Asia. For more than fifty years it has been an important forage crop in parts of Europe.

The Experiment Station introduced it into this state in 1888. Since then it has been successfully grown in many counties and on

many different types of soil. Hairy vetch has a very wide range of adaptation both in regard to soil and climate. It has been successfully grown from Canada to Florida.

The plant produces numerous slender branches or vines, varying in length with the richness of the soil, from three to twenty feet. Both leaves and stems are covered with fine hairs; hence the name. The bloom is purple and the seeds black, round and about the size of an okra seed. The pods burst open when ripe, the seeds fall out and re-seed the land.

FIG. 3.—FLOWERS OF HAIRY VETCH.

Hairy vetch is a very hardy plant and after the roots become well established in the soil, withstands cold, heat and drought, but does not grow well on very wet or overflowed lands.

Vetch is a nitrogen gatherer, and when tubercles are formed on the roots, has the power, like cowpeas and clovers, of absorbing, through its roots, the free nitrogen of the air and fixing a portion of it in a form to become either a fertilizer if left in the soil or a muscle forming food in the forage.

Methods of planting.—Fall planting has invariably given best results at this Station. Between August 20th and October 1st seems to be the ideal time for planting. Seed sown in the fall will germinate after the first good rain and grow off rapidly. By the time the coldest weather usually appears the plants are well rooted and able to withstand the freezes. The seed may be planted in the drill or sown broadcast. The only advantage in drilling is that fewer seed are required. If the seed are drilled in rows 2 to 2 1-2 feet apart 30 to 40 pounds per acre will give a perfect stand. If sown broadcast one bushel of seed per acre is required. Whether the seeding is to be broadcast or in drills the land should be thoroughly prepared. The seed may be sown broadcast by hand and covered with a harrow. For drilling the seed a corn planter with a plate for planting sorghum proved very satisfactory.

On one plat where 30 pounds of seed were planted per acre in drills 2 1-2 feet apart the yield of clean seed was 5.85 bushels per acre. On a similar plat the yield of cured hay, cut May 1st, was 2,774 pounds per acre. On another plat sown broadcast at the rate of 60 pounds of seed per acre, the yield of clean seed was 7.4 bushels per acre. A similar plat, cut for hay May 1st, yielded 3,565 pounds of cured hay per acre. The stubble, on the plats that were cut for hay May 1st when the plants were in full bloom, died, which indicated that a crop of hay and seed cannot be gotten from the same crop the same year.

Vetch sown on thin sandy or clay upland without inoculation, makes a small feeble growth for the first year or two, or until the land becomes well inoculated, which seems to require about three years for this crop when unaided by artificial means. On land of this character artificial inoculation is necessary for the best results. Vetch sown on upland of medium fertility will ripen seed earlier and the yield of seed in proportion to vine will be much greater than when sown on rich valley land.

When the crop is intended for hay, soiling or pasture the rich valley land will give best results. Vetch, like the cowpea, when sown on rich moist valley land will produce a very rank growth of vine and mature few seed.

Gathering seed.—Vetch sown in September will commence to bloom about the first of May and continue in bloom until July. The majority of the seed will ripen by June 10th and should be gathered without delay, to lessen the loss from shattering out. Many farmers have lost their crop of seed by waiting for the plants to finish blooming. This crop ripens its seed very unevenly, and after the bulk of the seed are ripe the vines continue to bloom. The only safe guide as to when to gather the seed is to watch the crop closely and as soon as there is a good crop of seed ripe harvest it. As the seed ripen the vines begin to die at the crown and are easily broken off. The ordinary hay rake is a simple and excellent implement with which to harvest the crop. The mower cannot be used successfully on account of the recumbent habit of growth of vetch. Where oats or wheat are sown with vetch to hold the vines up the crop can be easily cut with the mower. When there is no small grain mixed with the vetch the mower is not needed on account of the ease with which the vines can be pulled. The vines are raked into windrows just as is done with hay. If the vines are rank and heavy and the rake fails to get them clean the first time over, the field is gone over again in the opposite direction to the first. The raking should be done when the vines are damp, after a light rain or early in the morning while the dew is on, to prevent shattering the seed.

The vines may be left in the windrow until dry, and then hauled to the thresher or put up in cocks. After the crop has been taken off the field the land may then be broken and sown in cowpeas, sorghum or millet for hay. The hay crop will be ready to cut by the latter part of September, and the stand of vetch will be as good or better than it was the previous year. There will always be enough seed shattered out to perfectly re-seed the land.

Vetch for spring pasture.—The demand for late winter and early spring grazing crops has increased very materially in this state in the last few years. This demand arises from a variety of causes, chief among which is the increased interest in dairying and the beef industry. From early summer until autumn the regular pasture crops, such as bermuda grass, water grass, melilotus and lespedeza, will supply the needed forage, and ensilage will tide over late autumn and winter. There is on nearly every farm a period of shortage of succulent foliage from March 1st until grass starts, this period may be bridged over with vetch and winter oats. It is neither good management nor economy to turn cattle to pasture, after having wintered them well, before the grass is large enough to furnish good grazing. This is too

frequently the case in this state with young growing beef cattle. Bermuda grass is the basis of pastures in this state and this grass is not far enough advanced to carry cattle well until about the middle of May. As a rule, the winter feed period closes the first of March and cattle are turned to pasture. Winter oats and vetch, if properly managed, will fill this gap from March to the middle of May.

FIG. 4.—VETCH AND OATS.

It is not a good plan to commence grazing the vetch too early. In very favorable seasons vetch sown in September will be large enough to furnish light grazing by December, but for best results the stock should be kept off the field until the vetch has made more growth. If it is desired to have the vetch re-seed the land it should not be too closely grazed, and the stock should be taken off of the field about the middle of April. After the seed have ripened, the land may be broken and sown to cowpeas or sorghum for hay or planted in corn to be used for ensilage. This plan does not leave the land idle during any part

of the year and the hay or ensilage crops will not interfere with the stand of vetch for the next season.

Last spring the Station had fifteen acres of their upland in Winter oats and vetch to be used as a spring pasture. This field carried thirty head of young cattle from April 15th to May 15th, and after the cattle were removed from the field, produced seed enough to thoroughly re-seed the land. The field was then plowed and planted to cowpeas. This method of having one leguminous crop follow another will enrich the land very rapidly. Vetch is also a winter cover crop and prevents, to a great extent, the loss of plant food from washing or leaching during winter and early spring.

Vetch and Johnson grass.—These two crops will occupy the same land without interfering with each other: One making its growth during autumn and winter, while the other grows during spring and summer. These two crops have been grown together on the college farm for several years. The vetch will furnish grazing during late winter and early spring and then produce a crop of seed or hay. The vetch will delay the first cutting of grass from two to three weeks, but on account of the nitrogen added to the soil through the vetch, the yield of hay for the season will not be lessened. The vetch so completely shades the land in early spring that there will be few, if any, weeds in the first crop of hay. The grass gets thicker and grows wore rapidly each year, as the vetch adds nitrogen to the soil.

Vetch sown on bermuda sod will furnish early grazing for three or four years before the grass chokes it out.

If it were not for the high price of seed, which at present sell at from four to six dollars per bushel of 60 pounds, vetch would make a most excellent winter cover crop for the cotton lands of the South. The seed could be sown at the last working of the cotton and cultivated in with a side harrow or any shallow running implement. The vetch would not be tall enough to interfere, in the least, with the picking of the cotton, and could be plowed under as green manure early in the spring.

LESPEDEZA.

E. R. Lloyd.

This plant, it is claimed, was introduced into this country from Japan, and was first noticed in South Carolina, but is now perfectly

at home all over the South, and as far West as Texas and North to the Ohio river. The clovers in some of their varieties are adapted to almost every soil where the plow can provide the means of human existence.

Were nature as thoughtless as man, some portions of the South would soon become a desert waste, but nature is ever aiming to build up and restore. As an example of this, we might note the fact that lespedeza sown by no human hand, spreads over the abandoned fields of the South and restores the wastes of the cotton planter. Lespedeza is rather slow to start in spring, making little growth before June, but after that time grows very rapidly, and even on very poor land will furnish excellent grazing from July 1st until frost. While an annual, it will perpetuate itself without care. This plant will furnish more good grazing on poor land and keep stock in better condition than will any plant I have ever seen. And unlike the other members of the clover family, seems to be adapted to nearly every character of soil.

On poor land it maintains its dwarfish habit of growth, covering

FIG. 5.—HABIT OF GROWTH ON POOR LAND.

the ground with a thick green foliage from one to four inches tall.

On good land, especially a rich loamy valley, the growth will be from twenty to thirty inches high, and will yield from one and a

FIG. 6.—HABIT OF GROWTH ON RICH LAND.

half to three tons of fine hay per acre. The hay is the easiest to cure of all the clover family. The plant contains less moisture than the clovers and requires only a few hours of sunshine before it is safe to rake into windrows. Another point in its favor as a pasture plant is that, it never bloats animals as does red clover and alfalfa. The hay has a greater feeding value than red clover, and will demand a better price than either bermuda or timothy.

After lespedeza has gotten a start on poor land, and if left alone it will in a short time crowd out the weeds and other worthless plants, and while its growth on this character of land will be low and spreading,

it will be thick and tall enough to furnish splendid grazing. This plant is affected less by long drouths than is most of the pasture plants. In seeding the land, one-half bushel of seed per acre is ample. The seeding may be done early in the spring—the last of February or early in March; or, when preferred, the seed may be sown on oat land in the fall. After the oats have been harvested, the lespedeza makes rapid growth and in September or October a good crop of hay may be cut.

THE VELVET BEAN.

E. R. Lloyd.

The velvet bean is supposed to have originated in India and was introduced into this country by the Department of Agriculture. It has been cultivated for 30 or 40 years in Florida. At first as an ornamental plant, but recently it has attracted considerable attention as a forage plant and for renovating worn soils.

This bean grows very luxuriantly, on good soil, producing vines from thirty to fifty feet in length. The leaves and stems are larger than those of the cowpea. The pods are almost black, cylindrical in shape and covered with a black velvety down, from which it derives its name. There are from three to six seed in each pod. The seed are much larger than those of the cowpea and the pods do not split open when ripe.

It requires a long season in which to ripen seed, from eight to eight and one-half months. In an average season, few seed are ripened except where the vines have run on some support.

The planting should be done as early in spring as possible after the danger of frost has passed.

It is best to plant in drills with rows from three to four feet apart and two to three seed dropped in a place from one to two feet apart in the drill. The crop should be cultivated once or twice with a shallow running implement to give the plants a good start.

While the analysis shows velvet bean hay to equal cowpea hay in feeding value, practical feeding trials at this Station does not so indicate.

FIG. 7.—PODS AND LEAVES OF THE VELVET BEAN.

The stock ate it very sparingly and refused it when other hays were accessible. On account of the great length to which the vine runs, it is very difficult to cut and handle. We do not recommend it highly for hay. As soon as the vines completely cover the ground the lower leaves begin to fall off and form a very rich mulch.

This plant is very valuable on thin upland as a summer cover

crop, it will completely shade the land during the greater part of summer and produce an immense quantity of vegetable matter to plow under in the fall.

THE VALUE OF BREEDING IN CATTLE.

In discussing this subject, Mr. W. G. Harding, General Live Stock Agent of the Mobile and Ohio Railway, spoke as follows:

"Having been raised in the vicinity of the blue grass farms and stock raising establishments which were all handling the pure breeds of stock, it did not occur to me that any one would handle scrub stock unless they were so unfortunately fixed as to prevent them handling any other kind.

"I do not remember when the first question was put to me in regard to pure-bred cattle, but I always asserted that good cattle were the best to raise before I could find data to convince people that I was right.

"Only one experiment has been conducted to my knowledge for the distinct purpose of ascertaining the difference in value between the blooded animal and the scrub, and done with car lots of cattle. The experiment to which I refer was conducted in the State of Illinois for the express purpose of determining how much difference there existed from a feed-lot standpoint, between common cattle on the one hand and choice to fancy beef cattle on the other.

"What was considered choice and fancy cattle were such as can be produced by two or three crosses of Shorthorn, Hereford or Angus blood on the common cattle of the country. And what were classed as common were the scrub things without any grading or character and did not show any sign of good breeding. In the summary of this test the experimenters said more rapid and much larger gains may be secured on the better than the more common grades. We find on a fair basis of calculation that the choice to fancy steers made a gain of 9.74 pounds whereas the common cattle made a gain of 7.61 pounds for every bushel of corn consumed.

"This shows that the choice cattle produced 2.13 pounds more beef per bushel of corn consumed than did the common cattle.

"When sold the choice cattle brought $5.40 per hundred pounds

FIG. 8.—GRADE ANGUS YEARLINGS.

and the common cattle being fat and no longer common sold for $4.80 per hundred pounds. The 2.13 pounds of choice beef, which the common cattle did not produce was worth 11½ cents in all, and this was the value of good blood over the scrub on every bushel of corn fed.

"The choice cattle realized 46½ cents per bushel for the corn fed, while the scrub cattle realized only 35 cents per bushel. One of the recent sales of cattle at St. Louis was a load of Mississippi beef cattle which averaged 1,517 pounds and sold at 5 cents, or $75.85 per head. They were Mississippi bred, Mississippi raised, and Mississippi fed—they were high grade Shorthorn cattle raised and fed by Col. F. M. Abbott, Abbott, Miss. On the same day at Kansas City not a single load sold higher. This shows the value of good breeding on the one hand, and that what can be done in Illinois or Iowa can as well be done in any Southern state. There is one step further in the life of the cattle in which the value of blood is apparent. In the stocker or feeder trade, the cattle graded by any of the improved beef breeds are worth from three-fourths of a cent to two cents per pounds in market over and above the cost of the common cattle, according to grade, quality and condition of offerings and the condition of the market."

In conclusion the speaker said:

"It is plain to me that under no reasonable circumstances does blooded stock fail to pay.

"The planter-stockman who has cows and wishes to sell his calf crop annually gets more for half-breed calves, by four or five dollars per head, than his neighbor who has a grade bull.

So it runs through every branch of the cattle business. Men may reasonably differ as to which breed is best for their purpose, or locality,

FIG. 9.—GRADE ANGUS CALVES.

but no difference can longer exist as to the expedience and necessity for raising high-bred cattle through the length and breadth of the South, where in my opinion, the highest development of blooded stock can be attained."

GRAZING HOGS.

E. R. Lloyd.

Mississippi has a population of 1,551,270 and 221,110 farm homes. In the State in 1904 there were 1,087,780 hogs valued at $4.80 each, or about five hogs to each farm. Notwithstanding the great advantages possessed by this State for profitable hog-raising, we are importing, annually, about fifty per cent. of all the pork consumed. This should not be so. With our facilities for producing cheap feed, we should export and not import hog products. There are some features in hog raising that should appeal to every thoughtful farmer. No other

meat-producing animal is capable of producing so many young in a year. In our mild climate where suitable pastures can be provided for nearly every month in the year, the sow should farrow twice annually, producing one litter in early spring which can easily be made ready for the late fall or early winter market, and another litter in early fall to be made ready for the spring market. The small amount of capital required to begin with and the quick returns on the investment should make hog raising especially attractive to the small farmer with limited means. The hog will make a pound of gain on less food than most live stock, and will profitably utilize the waste products around the farm, dairy and kitchen.

At present, there is a strong demand at very attractive prices, for what is known as the light market hog, weighing from 130 to 150 pounds. A hog of this weight can easily be produced with ordinary care at from four to six months old.

No man should attempt to raise hogs without adequate pastures. For pastures, woven wire is the best fencing material, all things considered. Around the field to be used for pasture run a woven wire fence thirty inches high with three strands of barbed wire above. This fence will not only turn hogs but other live stock.

For convenience in preparing the land and planting the crops, it is best not to divide the pasture up with permanent fences. When the crops are ready for the hogs, by using the hurdle or portable fence, the field may be divided into lots of any size. The hurdle fence is

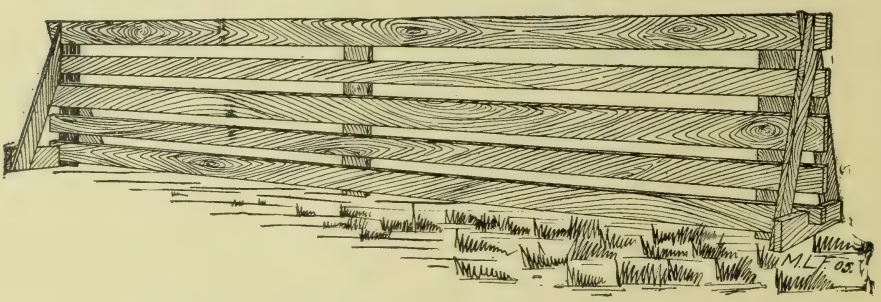

FIG. 10 —PANEL OF PORTABLE FENCE.

simple and cheaply made and when not in use can be taken down and stored under a shed until needed again.

There is a mistaken idea held by some, that alfalfa, red clover, rape and similar crops, will produce profitable gains when pastured without grain. The practical trials made at many experiment stations prove this not true. Of the many forage plants, alfalfa is one of the most

satisfactory for hogs, since it can be made a permanent pasture and is rich in protein, making an excellent combination with corn. The leaves are tender and the stem small which make it easily masticated and it is very much relished.

At the Mississippi Station careful tests have been made to determine the value of alfalfa pasture without grain for hogs. Pigs ranging in age from three to twenty -four months have been used, and the results of two years work show that alfalfa is little more than a maintenance ration for growing hogs without grain. Satisfactory gains have always been secured from alfalfa pastures by supplementing the pasture with from one to two per cent. of the weight of the hogs in corn or other grain.

FIG. 11.—PIGS IN COWPEAS.

Cowpeas without grain so far has given better results than any other crop for hog pasture. In one test the crop was grown on thin hill land, where one acre of cowpeas produced 350 pounds of pork. In another test on rich valley land one acre of cowpeas produced 483 pounds of pork. The hogs were put in the field when the peas were about ripe.

SURFACE DRAINING IN THE YAZOO-MISSISSIPPI VALLEY DELTA.

J. W. Fox.

The natural drainage of the Delta is remarkably good. Every section has its deep channel, either river, creek, or bayou, and it is the exception when a plantation has no natural drainage outlet. Fur-

thermore, there is sufficient fall in almost every cut of land to drain it, if the drainage basins are provided. It is with these drainage basins, their shape, method of construction, etc., that we are concerned. Drainage basin is a much better term than ditch. The popular conception of a ditch is a water way with steep banks, generally made with a spade and shovel, the earth from which being piled immediately on one or both sides. These ditches cannot be crossed by teams; therefore, the plow furrows can not go into them, and the water, which follows the middle furrows of each row or land, is banked at the ditch to stand until evaporated. These ditches can be readily seen as far as can the plantation by the rows of cotton-wood, willows, briers, weeds and bermuda grass which grow along their banks, to mar the effect and create a look of neglect and unthrift, which is too common in the country. These ditches are very expensive, as is all man labor. They do not do what they are supposed to do; they do not drain the land, they take up land that should be cultivated; they are the means of distributing bad grasses; they are altogether an eye sore and an abomination, and should be forever relegated to the past.

Drainage basins are shallow water-ways made by teams and machinery and therefore at minimum cost. The earth is moved back into the depressions, and the basins, being broad and shallow, can be crossed by teams, the plow furrows running out into them, thus carrying off the water. They can be cleaned by team power, and they take up very little ground; any one looking over such a plantation would see nothing but growing crops, yet the water-ways would be present, ready to carry away quickly all surplus water.

These drainage basins should be properly laid out, and the safest way to do this is with a level. Every plantation should have a farm level, which will cost about $30.00, and can be operated by any intelligent manager. The implements used to make the drainage basins on the large plantations would be the regular road machine and drag scrapers, supplemented by the farm road grader, a two-horse machine. On the smaller places, the two-horse road grader and the drag scrapers would suffice. With these implements and with good teams and intelligent supervision, it is remarkable how quickly and with what small expense a plantation can be drained; and, remember, "Drainage is the controlling factor in crop production in the Delta." Plantations that are supposed to be well drained could be immensely benefitted by a complete system, and farms that are entirely unreliable now, on account of water conditions, could be made uniformly productive.

It is not the dry seasons that the Delta fears, but the wet ones; therefore, it behooves this land owner of the magnificent farming section to put some brains into this problem, abandon the absurd "spade and shovel" ditch and properly lay out, construct, and maintain a complete system of drainage basins, sufficient to carry off the surplus water.

What has been said in regard to Delta drainage will apply to all level sections.

Remember, that we are discussing surface drainage and nothing in the above is to be construed as being inimical to underground or tile drainage. This, in fact, is the ideal way to permanently get rid of the surplus water, and a start has already been made in the Delta. This will be extended much more rapidly when sufficient factories are built here to supply the demand, and thus save a big freight charge.

THE POSSIBILITIES OF FRUIT GROWING IN MISSISSIPPI.

E. C. Crampton.

A number of years ago the president of a school, which I was attending, in a lecture before our class, stated that there were two unfortunate classes of human beings in this world. The first was the person who knew more than he could tell, the second was the person who could tell more than he knew. At that time I accepted this statement as true. Later in life I came to the conclusion that that eminent instructor had made a mistake, and that he should have said that there were two periods in each human life, the first period occurring in early life, when we felt that we knew more than we could tell, the second period occurring later in life, when we began to realize that we were telling more than we knew. For who is there among us that when first starting out on a chosen vocation in life has not felt that his knowledge was great and his wisdom profound, and who later on has not come to realize how little he knew of nature and of nature's work?

Born and raised in the fruit growing district of Western Pennsylvania, where if we raised two crops of fruit in five years we thought we had done well, and, if perchance we succeeded in raising three crops in four years we considered ourselves very fortunate indeed. Yet, under these adverse circumstances we made money. I have grown

orchards in Tennessee, Michigan, and for the past two years in your own State of Mississippi. I have also examined closely into the possibilities of fruit growing in nearly every state in the Union that makes any pretense as a fruit growing state, and can say to the residents of this State that your opportunities are unlimited, and your possibilities what you make them. Your climate and soil conditions are good, you have good local markets, and in most parts of your State you have good railroad facilities for marketing your fruit at a time of the year when the market is not likely to be overstocked and the prices received will be good. Now, with these things in your favor what more can you ask?

Under my care is a number of commercial orchards, and it is of one or two of these that I want to tell you. One block of ten acres of three-year old trees last year, after all expenses were paid, netted the owner over $451.00. This year this same orchard, notwithstanding a hard freeze and a heavy frost which materially injured the yield, netted the owner as much money as it did last year, making over $900.00 on a $1,200.00 investment in two years, and the orchard is now just coming into good bearing. Two years ago a young man who knew nothing about fruit or fruit farming, bought a small block of land containing 300 peach trees, about 30 plum trees and the same amount of pear trees, and from these he last year had a net profit of $180.00. I am unable to tell you what his profits are this year, but I do know that from 50 Greensboro peach trees he had a net profit of $101.00 and that his plums averaged 65 cents per four-basket crate and four crates to the tree. Now, do not think that I want every one to become a fruit grower, but I do think that every man who fails to provide the necessities of life for his family should be prosecuted for criminal negligence, and it has been proven that fruit is not a luxury, but an actual necessity for the health of the family.

Some will say that it is not necessary for them to raise fruit, because their neighbor on the right has plenty and they usually get about what they need there, and that their neighbor on the left has a fine plat of strawberries and when the market gets so it does not justify him to ship, they can go over and get about what they need there. Now, in both of these cases mark the expression of, "about what they need." I want to tell you that the man who depends on his neighbors for the necessities of life is either an object of charity or a beggar—hard words these but true. Another class say they do not know how to prepare the soil or what varieties to put out. For this class of persons I have

some respect and would say to them that this A. & M. College was established to impart just such knowledge to just such people, and that such information obtained from the professors at this College would be correct, as the A. & M. College of Mississippi is recognized as being among the leading agricultural colleges in the United States, and its professors are men of note.

There is also a moral side to the possibilities of fruit growing in Mississippi. To you people who have no family orchards, do you think you are doing your duty by that wife whom you have promised to love, honor and cherish, by failing to provide for her that which is so easily provided, and is so essential for the welfare of the family?

Do you think you are doing your duty by that daughter by failing to provide that which goes to make home more cheerful and life more bright? Do you feel that you are doing your duty to that son by making him a thief, causing him to steal from your neighbor that which his system requires, and which you fail to provide?

Now, in conclusion, do not go home and overdo the thing. Do not go home and prepare the ground and set out your family orchard and take care of it a year or two and then trust to Providence to do the rest. Providence is a good thing to put your trust in, but a very poor care taker of orchards, and don't forget that the Lord helps those who help themselves.

COMMERCIAL FERTILIZERS.

G. H. Alford.

We use about one hundred and twenty thousand tons of commercial fertilizers in Mississippi every year. We pay about two and one-half million dollars for commercial fertilizer annually. We spend more money for this kind of fertilizer than we do for education. It is, therefore, well for us to devote some time to a study of this very important subject.

A fertilizer is defined as any substance which, by its application to the soil, is intended to produce a better growth of plants. As farmers, we usually divide the subject of fertilizers into two parts, home-made and bought or commercial fertilizers. The subject assigned me is commercial fertilizers.

Commercial fertilizers are mixtures of fertilizing materials sold under trade names. These fertilizers may be complete or incomplete. What is known as a complete fertilizer contains nitrogen, phosphoric acid, and potash. An incomplete fertilizer contains only one or two of these three elements.

Experiments have proven conclusively that by far the larger part of the soils of this country are deficient in nitrogen, phosphoric acid, and potash. However, we are interested only in the needs of Mississippi soils. We learn from the bulletins issued by our Experiment Station that our soils are deficient in nitrogen and phosphoric acid only. Potash in any form fails to increase the yield on our soils.

Nitrogen is supplied in one class of materials and phosphoric acid in another. The fertilizers for Mississippi soils should be made by mixing one or more of each of these two classes of materials in such quantities as will produce maximum crops. It is, therefore, desirable for us, especially when we mix our own fertilizers, to be familiar with the materials furnishing nitrogen and phosphoric acid, their richness in the plant food needed, the proportion of this plant food which the crop to be grown use readily, their special fitness for certain crops and soils, and in fact all of the advantages that they may possess over each other.

We may obtain nitrogen from the following materials: cotton-seed meal, dried blood, nitrate of soda, and a number of other materials. Four-fifths of the air we breathe is nitrogen. We thus see that nitrogen is an exceedingly abundant substance, and yet it is the most costly constituent of fertilizers and the plant food in which thousands of acres of our worn out cotton lands is most deficient.

Nitrogen can be obtained from the air for less than nothing by growing pod bearing plants, such as peas, peanuts, beans, vetches, clovers, etc. Most all soils contain millions and millions of nitrogen-gathering bacteria—minute forms of life which can only be seen with a powerful microscope. These bacteria wound the roots of pod-bearing plants and cause a sap to exude like gum on a peach tree. This gum, nodules, or tubercles is the dwelling place of these bacteria while they transfer nitrogen from the air in the soil to the crop. All that is necessary for us farmers to do in order to comply with the demands of these nitrogen-gathering bacteria is to plant pod-bearing plants and drain the soil well.

If a farmer has a super-abundance of money and prefers to pay for his nitrogen, cotton-seed meal is the cheapest and best material

in which he can purchase it for staple farm crops. The nitrogen in the cotton-seed meal becomes available for the plants fairly rapidly but will feed corn and cotton until maturity.

Dried blood is the richest in nitrogen of any animal product used for fertilizer. It is obtained from the slaughter houses where the blood of animals is collected and dried. Blood is the quickest acting source of animal nitrogen and if there is any difference it probably is quicker than cotton-seed meal.

Nitrate of soda is the quickest acting form of nitrogen and is also the most expensive. It is the form of nitrogen that plants like most and will use in the greatest abundance. Its effect on growing plants can often be seen in the increased vigor and greenness of the plants in twenty-four hours after the application is made.

Acid phosphate is the chief source of phosphoric acid in fertilizers A high grade acid phosphate is by far preferable to a low grade. It ought to contain at least 16% of phosphoric acid.

Now, having discussed briefly several of the most important materials entering into fertilizers, it is advisable for us to learn how to mix these materials in order to secure the most economical results from their use. It is, of course, impossible for any man to tell a farmer in just what proportion to mix cotton-seed meal and acid phosphate in order to secure the most profitable returns on the purchase money, the economical use of cotton-seed meal and acid phosphate depends on the previous treatment of the soil and upon its mechanical condition fully as much as upon its present chemical condition. The chemist can analyze the soil and find a sufficient amount of nitrogen and phosphoric acid in it to produce enormous yields for many years, but his analysis will show nothing of the availability, and hence will be of little value in determining the proper mixture of cotton seed meal and acid phosphate for the soil. There is one way and only one way for us to gain this information and that is by experimenting for ourselves.

While it is impossible for us to say just what is the best combination of cotton-seed meal and acid phosphate for our different crops and soils, we can be guided by the results of our experiment station, together with the results obtained by other experiment stations on similar soils and suggest with considerable confidence formulas for cotton and grains. With these statements in mind, we suggest the following formula for grains:

Cotton-seed meal.....1000 pounds.
Acid phosphate.....1000 pounds.

Total.....2000 pounds.

The following is suggested as a good formula for cotton:

Cotton-seed meal..... 750 pounds.
Acid phosphate.....1250 pounds.

Total.....2000 pounds.

The most profitable yields of cotton and grain crops will be secured when the crops follows leguminous crops. Leguminous crops fertilized with acid phosphate put the soil in the best possible condition for cotton and corn. Where light crops of peas have been grown in corn or cut from the land it is advisable to add some nitrogen as well as phosphoric acid to the soil for a crop of cotton or grain. In this case, we suggest that the nitrogen furnishing material in the above suggested formulas be cut in half.

An application of acid phosphate is all that is necessary to obtain maximum yields from pod-bearing or nitrogen gathering plants.

The amount of fertilizer that can be profitably used depends mainly on the mechanical condition of the soil. If the soil is thoroughly pulverized for from eight to ten inches deep and full of vegetable matter it will generally pay to apply from five to eight hundred pounds per acre. If the soil is devoid of vegetable matter and is broken into clods for only about two inches deep, it is not advisable to apply more than two hundred pounds per acre.

The application of cotton-seed meal and acid phosphate should be made about one week before planting. It does not pay to make two applications, one before and one after planting, except when very heavy applications—say one thousand pounds per acre—are made. When over one thousand pounds of fertilizer is to be used, it is advisable to thoroughly mix it with the soil in the furrow before planting.

Many cotton farmers have supplanted all of the more economical and lasting methods of increasing the productiveness of their soils with commercial fertilizers. They plant cotton on the same land year after year; they do not grow leguminous crops on their farms; the manure from a few scrub stock is permitted to go to waste, and the soil is scratched instead of being thoroughly plowed. Ten times as much

commercial fertilizer ought to be used in Mississippi as is now used, but it ought to be used as a supplement to the other more economical methods of increasing the productiveness of our soils.

FARMING AS A BUSINESS.

W. B. Mercier.

The speaker, in discussing this subject said that the old idea that the farmer did not need training was fast disappearing. That no other line of work requires greater forethought and nothing else offers greater opportunities for the development of business ability.

The opportunities to the young men are unbounded, but to insure his success in this line of work he should take a thorough course in some good agricultural college. Farmers whose school days are past are urged to read the various experiment station bulletins and attend the Farmers' Institutes. The necessity of applying strictly business principles to all lines of farm work is emphasized.

Only the most profitable crops should be raised, all feed should be saved, good stock should be kept, and the fertility of the soil preserved. The use of improved machinery to take the place of high priced labor is deemed desirable. Diversified crops are necessary to success. The wide-awake farmer will keep books.

In regard to farmer organizations, the speaker said in conclusion:

"We must not fail to call attention to the bearing organizations among farming communities have upon their business standing. This is a day of organization and counter-organizations. No business or profession is without them, and when every one adopts a thing there must be some good derived from it. The farmer cries out against organizations in other enterprises, but fails to realize that it is possible for him to organize into a body that could defy the world. Since we have trusts and combines with us, and they are here to stay, would it not be a sensible proposition for us to stop complaining and play them at their own games? If we will combine properly it is in our power to regulate freight rates, taxation, buy and sell our products at wholesale, thereby cutting out the questionable profits of middlemen and

commission men. We would fix a uniform and reasonable price on our farm products, and in hundreds of other ways take our business affairs into our own hands. This would stop every other vocation from fleecing us and we would cease to hear the cry of oppression from the agricultural part of our land. We read of where combines among farmers in the West have resulted in great benefit where they have handled their business themselves. In some instances they have actually run the trust out of business. This only serves to illustrate the power we could exert by combined effort. But as long as we are cursed by the credit system in vogue throughout the South, we need not hope for financial freedom. This evil can be eradicated by us, and until we arouse ourselves along this line and begin to examine into the business principles which underly our farming interest, we need not expect the universal prosperity and good will which might reign supreme among us.

"It is a generally accepted theory that we have not sufficient capital at command to develop our agricultural interests to the highest degree. All of us realize how handicapped any farmer is without sufficient money at hand to carry out his best plans and ideas to a successful business end. We must demonstrate to those who have money to invest that there is no business that returns such sure profits on the investment when properly managed as farming. When we succeed in establishing this fact to the satisfaction of the moneyed men of the country, we will have no further trouble in finding plenty of money at cheap rates of interest to be loaned on good farm security. When we consider that often our crops are cut off fifty per cent. in one year, and that frequentlywe suffer losses in stock and property that would bankrupt any other line of business, it should not be any great difficulty in proving to the capitalists of our country that no security is so good or certain for a term of years as a good farm with a wide-awake business-like farmer in control.

PRACTICAL APPLICATION OF FARMERS' INSTITUTE WORK.

Mrs. Clara S. Evarts.

Although it has been said that the farmers as a class do but little thinking, this is not true. But the fact that their environments make

them less dependent on each other than men of any other class, causes their thinking to be less effective. Artisans, business and professional men unite in societies, unions, or leagues and a few do the thinking for the many but farmers do their own individual thinking and act alone or not at all. They ought to organize and speak their thoughts and press their claims in a body; and right there is where Farmers' Institutes are destined to do a great work.

Mississippi is greatly behind other states in matters of good roads, good county schools and school houses, in improved breeds of live stock, up-to-date agricultural implements and cheap money.

I see before me today the representative farmers of Mississippi, and to you, gentlemen, I appeal to demand of our State some of the things we need for our personal advancement. Other classes do this, why not we? Sure it is, *no one else* will make demands for us, or consider our needs if *we do not.*

First of all, let us unite in a demand for better country schools. Are not our sons and daughters as bright and intelligent as those born in town? Do they not have the same need for an education and are they not as capable of receiving it? The farmer pays more taxes according to his actual financial condition than any other class and so far in the improvement of our state has received less direct benefit than any other class. Let us demand as good schools for our children in the country as for those in town and never rest until we have them. Other states have done and are doing it and we can and will in Mississippi if we present our claims, backed by proper organization.

Another crying need is better roads, and it is to the credit of this institution that the improvement of public roads is one of the subjects under discussion. Gentlemen, allow me to say to you that I trust that the information gained from this discussion will be put into practical application in every road district represented in this gathering.

It is just as natural for young people to seek society as it is for the wind to blow, or the flower to open. Better roads giving us better social advantages and opportunities will go a long way towards solving the problem of how to keep our sons on the farm. Let us demand of our law-makers better roads. Again we say better a state debt than roads nearly or quite impassable for two or three months of the year, which so materially interfere with so many of the financial interests and home comforts of the farmer. The money spent on road making

will more than come back to the tax-payer in the increased value of farm lands to say nothing of the comfort and convenience to be derived.

Let us see to it that all present laws favoring the investment of foreign capital and fostering foreign enterprises be kept in force and still others enacted. Our state needs more and cheaper money and especially do our farmers need it, and we should not let the few money men of the state with their own interest at stake, sing us the siren's song until our ears are dulled to *our* interests. *Every man, every corporation* that can be induced to bring money here and invest it, or loan it directly to the people, not through the banks, is a public benefactor who helps just that much to bring prosperity within our borders, and give us some of the advantages we need.

Another need is a State Entomologist to protect us from the introduction and consequent ravages of foreign and destructive insects. I believe Mississippi is about the only state having any particular horticultural interests which has not a State Entomologist. I understand that unscrupulous nurserymen of other states, knowing that we had no state protection have sold a considerable amount of nursery stock in Madison county, and perhaps other counties of the state, that was affected by the dreaded San José scale, that deadly enemy of the peach tree, and as a consequence some of the orchards of Madison county must be cut down and burned and the owners of these beautiful orchards that promised so much profit become the victim of a state's carelessness and neglect. Nor does the evil stop here. Having been once introduced it is hard to check, and many other orchards may yet have to be sacrificed. Gentlemen, this is not right. The state should take better care of the interest of her citizens than that.

Gentlemen, Mississippi once stood among the foremost of the bright galaxy of States, and it is to you, the farmers of the state, that we look to again place her there and you through your local Farmers' Institutes must start the ball to rolling.

During my residence to the South, I have noticed that one of the strong characteristics of the Southerner is loyalty. Now, gentlemen, with the Farmers' Institutes as the open door whereby to approach the voters of the state, let your loyalty to this glorious old commonwealth take that form as will lead to such a bettering of conditions as to bring to us the best people of the North to occupy these idle lands, people whose money and energy superinduced by their vigorous climate will when combined with the knowledge and experience of the present residents place Mississippi where she justly belongs—the first and leading State of the Union.

THE RELATION OF THE RAILROAD TO THE FARMER.

M. V. Richards.

M. V. Richards, Land and Industrial Agent, Southern Railway and Mobile & Ohio R. R., before discussing the subject assigned to him, "The Relation of the Railroad to the Farmer," devoted a few minutes to agriculture, labor, education and good roads. He said in part as follows:

"The Railroads welcome and encourage every practical movement looking to the betterment of the agricultural interests of the country through which they run, and it would seem eminently fitting on this occasion for me to refer to a feature quite uppermost in the minds of the farmers—labor. It is a much discussed subject; to digest and solve it is no easy proposition. Keep the boys and girls on the farm will do much to aid in supplying the demand. To retain the presence and influence of the farmers' sons and daughters there are two factors at least necessary—*Good Public Schools and Roads.*

"People are never satisfied with their position or success in life. Generally they think if they could be engaged in something else they would be more successful.

"The city man thinks his life is hard, while the farmer is of the opinion his life is a burden. As to the advantages of one against the other it would not be my aim to enter into a full discussion, but I do wish to touch upon some phases sufficiently to make clear my views concerning the laborers for the farm. Farm life is healthful, congenial, and profitable. The farmer perhaps may have to work hard and long, but he is in the field and is in excellent health.

"There has for years been a steady movement of the farmers' boys to the city or town. I would at once advise that a serious mistake is being made by these young men in leaving the farm to become victims on the streets of our centers of population. The fact is that the farm offers better opportunities to acquire a competency and happiness for the average young man than any other vocation.

"That these young men may be encouraged to remain at home, permit the suggestion that the farmers must offer more encouragement,

especially in the way of better country schools and better country roads. The South should at once begin a campaign for better schools and roads. Educate the children fully and thoroughly how to farm, give them practical roads to travel over to and from school. Make the highways and byways attractive and you will create a disposition among the young men and young women of the country to 'stick to the farm.' Then you will not want for help to build up, improve and work the land. As you make the country atractive and develop 'home staying' qualities in your own people so will the desirable immigrant seek a home in your neighborhood.

"It is the character and attractiveness of the home life that regulates civilization. The commercial value of every farm in your State will equal its intrinsic value only when the country is developed properly and fully along educational, social and agricultural lines.

"A farm may be rich in soil, while the crops produced thereon are not commensurate with the soil's ability, or the prices you obtain at the market not profitable, simply because the methods employed in cultivation are not up-to-date, and the cost of getting the crops from the farm to the market too great on account of poor roads. Education will develop methods, intelligent work will make good roads.

"Practice scientific agriculture for it means an increase in the products of the farm and does not increase the acreage. Give proper attention to intelligent production and carefully study distribution if you would have the farm give the best returns. The future promises the Southern farmer magnificent results.

"Agriculture is the father of industries—trade traffic and commerce follow the development of the land. We will keep agriculture in the foreground if all interested in the land will co-operate. May the percentage of farm owners increase; may the cash and share tenant promptly secure and develop his own farm. As the farm owners increase in number, the average area of farms will decrease, the production of the country will increase. The land will be made to produce more for the reason that the farm owner places more capital into the land than does the share or cash farmer. The farm owner that rents his land spends the income therefrom elsewhere instead of keeping up the improvements and betterments.

"Farm products furnish about 10% of the traffic of the railroads of the country. While wages have increased, land values advanced,

more and better markets opened up, the transportation rates have not advanced.

"The policy of the railroad is to foster industry which means ren der its best services as far as practical in transporting the products of the farm and at reasonable rates. Co-operation between the farmers and the railroads is absolutely necessary in order to obtain the best results for both."

In discussing "The Relation of The Railroads to the Farmers" he said in part as follows:

"Among the most potent factors in the progress of civilization and advancement are the railroads. They open up to settlement and development sections remote from each other, and create and enhance values within their territory which would be simply impossible, save for their existence. They link section to section, State to State, and even nation to nation, in an enlarged sense, and develop and promote friendship and acquaintance, which could be made possible in no other way. All this has a favorable influence, and tends to the betterment of humanity, by breaking down and uprooting prejudices, born of ignorance and misundertanding, and supplanting suspicion and distrust with respect and confidence.

"By means of personal contact the homogenity of the race is discovered, the wants and needs of a common humanity ascertained, and an interchange of ideas is rapidly followed by an exchange of commodities and so trade and commerce are not only made possible but profitable to all parties concerned.

"Under the influence of a system of rapid transit, all sectional lines in our country are being rapidly obliterated, and practically speaking our entire country is a common and inseparable interest.

"This is not a mere bond of material selfishness, but a practical and tangible realization that we all have a need of each other, and that each one can do something for his fellows, and at the same time feel that he is promoting his own pleasure, welfare and happiness. This spirit of enlightened and ennobling selfishness—if selfishness it may be termed—cannot work harm to any, but, on the contrary, must inure to the good of all. All branches of industry are projected, primarily speaking, for gain. Farms are opened up, manufactories established, mines developed, banks organized, canals dug and railroads construct-

ed on the idea and expectation that they will make a good return on the capital invested. Railroads are, however, a peculiar species of property. They depend wholly upon the prosperity of the territory they are built to serve, and unless the section to which they are tributary developes and advances, they become a dear investment. From this statement it will be readily seen that an enlightened selfishness, if nothing else, would prompt them to pursue a line of policy and would tend to cause them to foster, encourage and promote every branch of industry that could be successfully prosecuted in their territory. They must of necessity do this, in their own interest, and business considerations compel them to be true friends of all their patrons, and never, in any case, their enemies. The success of one means the prosperity of the other, and the failure of one foretells the downfall and destruction of both.

"Railroad building and railroad management involve much more than is comprehended in the popular understanding of a common carrier of internal commerce. It is a complex science, since it involves the involuntary study of sociology, or socio-political economy, the science of mechanics, applied both to structural creation and propelling force, Algebraic equations; geometrical lines and solutions; the study gradients, curves acute, obtuse and serpentine; angles and arches; spans and supports; hydraulic pressure; resistance to wind, water and ponderable force dead and in motion; all these and more are involved in the building of a railroad and the propulsion of its carrying equipment. Again, in other departments, there is the increasing need and exercise of far-seeing calculation, in anticipating the demands for rolling stock at many and often remote points of shipment; to prevent the blockade of freight, or a famine of cars. There is the hurry call at any hour of the day or of the night to be met, when an inundation of tonnage or a sudden movement of passenger travel in excess of the normal, and perhaps out of season, springs a surprise on the manager or the division superintendent, in one, two or three places, all distant from each other. 'Providential occurences', also, such as freshets and washouts, the destruction of roadbeds and bridges, perennial everywhere, call into manly action the ingenuity, the physical energy, the experience and and executive genius of scores of people in the army of workers and thinkers who serve the great public. Wrecks must be cleared away and road bed and bridges rebuilt, in a night perhaps; and traffic restored before it accumulates beyond control

"The railroad is not a mere machine; it is a generator. Out of it come the possibilities, the opportunities, the industrial life, and the

social development which tend to the higher civilization. A number of men may combine their individual capital, experience and energies in the formation of a railroad company and the building, equipping and operating of a railway line. It may run through a section of country where solitude and wilderness have never been disturbed or effaced except where some lonely cabin or farmhouse stands. Lands in that vicinity may have been of small value, with never a buyer and few to settle on them; the products of the scattered farms may be unmarketable, because there are no means of transportation to a shipping townt or market place. Eager to have the railroads, the farmers will perhaps donate some of the cheap lands for a right of way. When the road is built, the country 'round about beg us to awaken from its apathy, indifference and inactivity. Natural ambitions stir with in the breasts of the settlers. Soon there are signs of improvement, then a rise in the price of farms, followed by customers for the farms. The railroad is carrying away the products of these farms and bringing back to them machinery, material for new buildings and implements for labor. Business is created, fostered and encouraged by the railroad. After awhile, the lonely settlement in the wilderness has developed into a community with school houses, churches, banks, stores and factories. Real estate is still rising in value, opportunities are still multiplying, and the outer world is coming in to view the new country and to invest, settle, or establish a business within it. The railroad has done this; the residents know it. The railroad has been the blessed factor, the projector, the one to risk first and to increase its risks, as the pioneer of possible development. Money and effort it has generously expended and continued to expend,casting its bread upon the waters of an unknown or uncertain sea, in the confident hope that in time—"some day"—it may return as a loaf.

"The railroad is not only the harbinger of prosperity, it is a potential factor in civilizing processes. Ignorance vanishes with the advent of the railroad. It links distant communities, makes possible the social intercourse of people living far apart and of different habits, customs, pursuits and ideas. It enables strangers to come together and become acquaintances, exchanging knowledge and experience, and borrowing from each other whatever is worth imitating, adopting or acquiring.

"The railroad affords supreme opportunity to the student, to the merchant, to the manufacturer, to the trader. The student is enabled, thro' rapid transit from one part of the continent to the antipodes, to learn the characteristics, the customs, the geographicical

and economic conditions of other sections of his country. The merchant is enabled to sell his wares in distant and new markets. The manufacturer is enabled to plant his factory or his mill afar from the markets or distributing points, with the choice of sites, localities and surroundings, to the enhancement of his profits, and the general betterment of his business.

"No section of the country can now be progressive, self-sustaining, intelligent, or even habitable by any large number of people, if remote from a railroad. Wherever the iron road is laid, its track marks the route of progress, enlightenment, education, enterprise and comfort and environment and growing wealth. Wherever the railroad is not found, the dusty country roads lead to shambling houses, to half tilled fields, to hoary jungle, to barren wastes, and stagnant material and mental conditions. The railroad, then is essentially a modern necessity; it is emphatically the pre-requisite of all concerted human effort toward self-advancement and social communal expansion. It is the people's friend and benefactor. If the railroads were once operated for the particular benefit of the manager and directors, that time is past. Railroads run upon that principle or for that purpose inevitably went down into bankruptcy. The modern railroad is striving always to get in touch and to keep in touch with the people who live and labor within reach of its lines. It is ever and tirelessly seeking alliances with local forces with the direct and earnest purpose of co-operation. It is ceaseless in its effort to build up every available section or portion of that territory, to develop its resources, to open to it new or better markets, to introduce into it new industrial enterprises, to aid it in its practical and honest ambitions. Such a course, such a purpose, such a mission is the one adopted by the well managed railway systems of the day. The company I have the honor to represent, organized but a few years ago—less than 14 years—began its career as a common carrier impressed with the wisdom, the necessity, the possibilities, of co-operation, of mutual aid between itself and the inhabitants of the country through which its lines extended or were being constructed. That policy has ever and steadily governed all its operations, its management and its plans of extension and development. And the success of that policy is today splendidly exhibited, in the increase and prosperity of its towns and villages, its farmland districts and its mining regions. Thousands of factories have been established along its lines; towns have expanded into cities and villages into towns; educational institutions have multiplied; coal and iron mines—those mighty sinews

of commerce, and weapons of industrial combat—have been opened in hundreds of localities where precious ores had lain buried through centuries untouched, unsought and useless.

"In this country alone there are upwards of a million of these public servants, and their aggregate influence upon social and business conditions cannot be easily over-estimated.

"In a true sense, then the railroad is a public benefactor; and this, indeed is the broad view held by the business public, by the man of large concerns and by the practical utilitarian. But there are are many otherwise good people—I will not term them a class—who entertain a mistaken and very unhappy notion as to the true mission of the railroad, as to its true relation toward the people of the section it traverses and serves; and exhibit a strange inappreciation of its real services in their behalf.

"Before the railroad comes among them, it is viewed as a thing of promise. But, as soon as the new order of things is established murmurs begin and complaints are made in the community and along the railroad line against the railroad. Prejudice, unreasoning, unjust and altogether ungenerous, is engendered in minds proud of their honesty of purpose and loth to believe in their own perversity. In some instances this prejudice grows into hostility, in some rare instances it even goes to the extent of violence; and without, in any case, the hostile party being capable of giving a reason or making an excuse for it. Argument with them is useless, they insist upon it that the railroad is a discerning thing; somehow, in some way, opposed to their personal interests, and toward which they feel bound to be hostile.

"In the eyes of other excellent people the railroad is a public enemy; in the honest opinion of many other equally nice people the railroad was built and ought to be operated for the special use and convenience of themselves, without regard to the necessity or convenience of other people. Trains should always be on time in arriving or leaving —at the particular point at which they get off or on. Freight cars should always be empty and waiting on sidings at their particular village, until 'they' are ready with a ton or two of freight. Rates of freight are always too high; and, generally considered, the railroad is imposing on them, somehow, in some way not explainable, perhaps, but darkly and feloniously. And still, singularly enough, these same good people would probably mob the railroad workmen, if the latter

were sent to tear up the track and remove the railroad itself to some other route. Such an act would only be an other outrage, another proof of the wickedness and depravity of their enemy—the railroad.

"Where such prejudice exists there cannot be hearty co-operation between railroad and people. It is unfortunate for both the community and the railroad, for their interests are identical in all that makes for local development, better facilities for trade, social intercourse and extended relations between sections. In short, where a community becomes hostile to the railroad at its doors, the situation is like that of a house divided against itself for, between husband and wife there is no closer tie or nearer kinship than between the railroad and the country it serves. The relationship is virtually impossible of severance, without the ruin of both. Imagine then, the folly of either one attempting to prey upon, to cripple, or destroy the other! Without the railroad, social intercourse between settlements more than a day's travel by horse ceases or does not exist; towns refuse to grow; factories are impossible; farm products decay even while undergoing transportation by wagon to distant and doubtful market towns.

"Contrasts between Past and Present, whether in domestic or public affairs, are usually interesting, always instructive. Sometimes they present startling or surprising differences or changes; and, scanning the horizon in the history of railroad building—we may claim for the railroads as rapid, as important and as progressive a series of changes, and improvements as numerous, as stupendous, as can be found in any field of human endeavor or achievement.

"Statistical information is not altogether in consonance with the purpose of this address, but incidentally it will serve, in a particular sense, to emphasize the proposition that railroad development within seventy-two years of its corporate existence has risen from methods and moulds which are now not only obsolete, but would be promptly condemned as impracticable. The crude and primitive railroad carriage and locomotive which first labored haltingly and with doubtful promise over the trembling roadbed laid in 1830 from Charleston, South Carolina to its final terminal at Columbia, were then of course, marvels as models of swift and new locomotion! Superseding the original tram road of wooden rails built by our Puritan fathers' sons from Quincy, Massachusetts to the granite quarries, the iron highway of South Carolina emerged from the primitive to the progressive stage, but still continued merely local in its service and accomplishment.

Later, when the memorable year of '49 gave birth to the California gold fever, the dream of Asa Whitney, (who two years before had begun the agitation of a trans-continental railroad) changed to reality. The Congress of 1862 passed an act incorporating and subsidizing the Union Pacific Railway; and a few years later the plains of Nebraska, Wyoming,Colorado and Utah were spanned by that grand artery of commerce which has proved the conduit for western migration; through which have poured the millions of sturdy yeomanry, of treasure, and the products of industrial art, making the West at once an important part of the great land in which we live.

"The completion and opening of the Union Pacific and the Central Pacific united the two oceans, the Atlantic and the Pacific. It was the tie between Hell Gate and Golden Gate—if the expression may be pardoned for the humor of it—and neither end of the route has yet had cause to regret the linking together of these two headlands upon which now sit, in their majesty, the beacon-lit fairies of a world's best civilization.

"But, however much has been accomplished to this hour by railroads in their afforded facilities, there lies before us a stupendous field and a countless population yet unserved. The world's human population exceeeds one and a half billions, spread over an area of 50,000,000 square miles, and served by 507,000 miles of railway. That is to say, that for each 117 square miles of the world's territory, and for each 3,100 of her population, there is one mile of railway. The proportion in North and South America, in spite of the advancement and achievement in the United States and Canada, is yet but one mile of railway to each 68 square miles of land, and each 433 of the population. These facts are enough to fire the most vivid imagination, to excite the most fervid fancy, in speculating upon the future of railroad building and its possible accomplishment."

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